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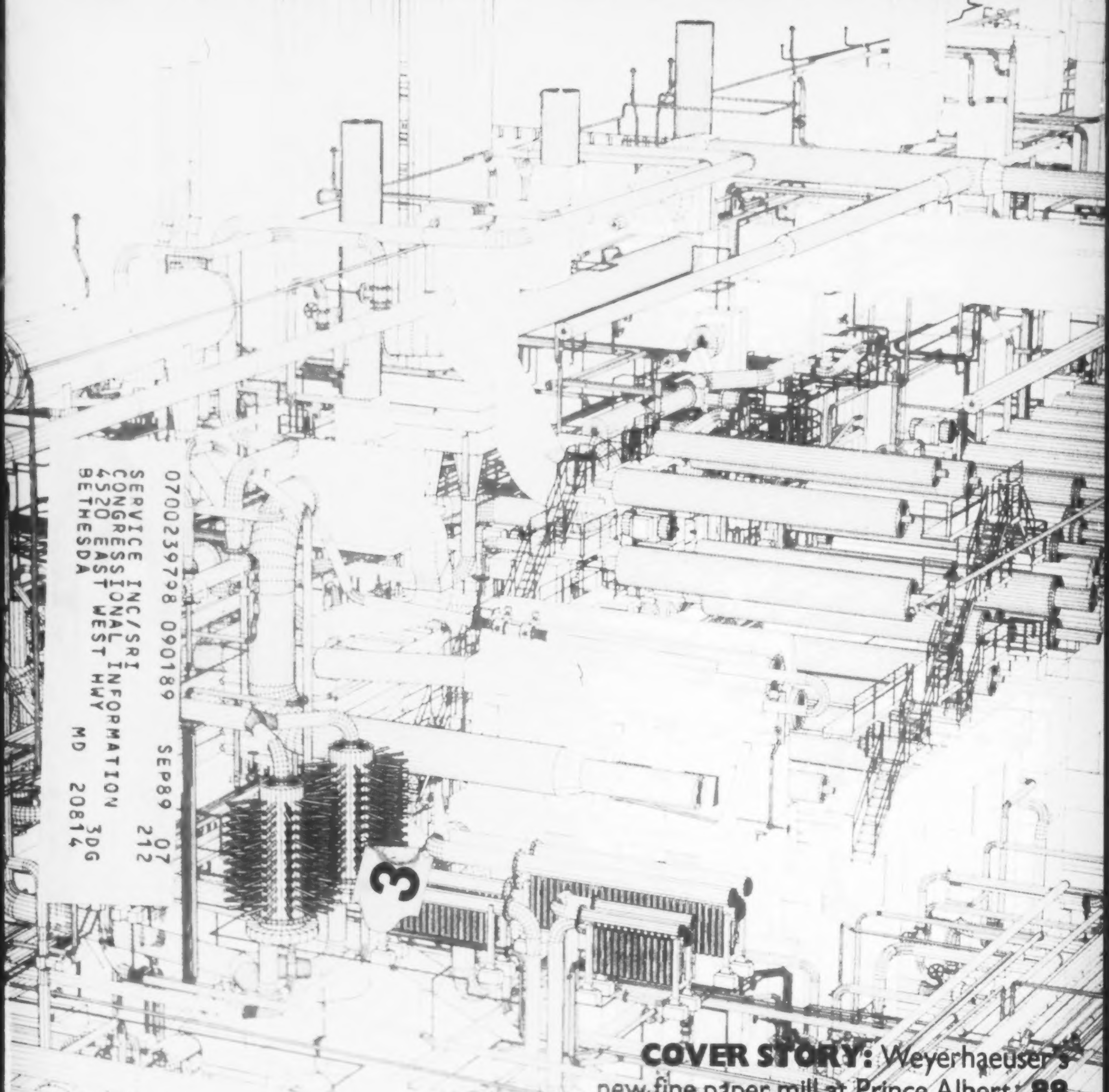
PULP & PAPER

November 1988



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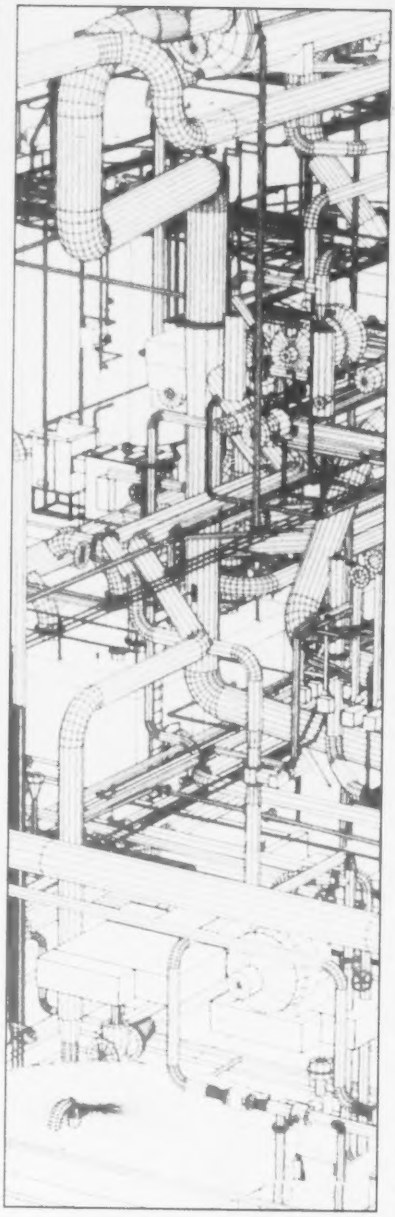

THE COVER

Computer-based, three-dimensional rendering of Weyerhaeuser Canada's new fine paper machine at Prince Albert, Sask. This expansion involved the most extensive computer modeling ever utilized on a pulp and paper project. See story on page 88. **(Photo courtesy of Construction Systems Associates Inc., Marietta, Ga.)**

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PULP & PAPER

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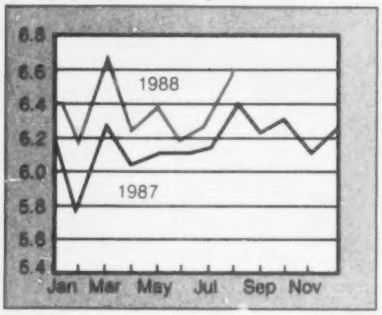
MONTH IN STATISTICS

U.S. paper and board production



U.S. production of paper and paperboard totaled 6.6 million tons in August, an increase of just 1.5% over the same month in 1987, according to the American Paper Institute. While demand continues at record levels for most grades, the rate of growth has definitely slacked off since earlier this year. While paper remained strong, paperboard production for the month was down 0.5% compared with August 1987. After seasonal adjustments, paperboard production was up 2.6% through the first eight months, while paper climbed 4.5% over the same period.

Among major grades, printing and writing papers continued to be very strong, led by big increases in uncoated groundwood and coated papers. Coated paper demand is so strong that the year-to-date import total was up 32% from last year, the API reported. In the paperboard sector, however, only semichemical medium posted an increase in August over last year.

Canadian newsprint shipments climbed 7.9% in August to 847,000 metric tons, as U.S. imports jumped 8.3%. Woodpulp exports declined 3.4% compared with a year earlier, however. Operating rates for the month were 100% for newsprint mills and 99% for woodpulp. ■

	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION[1]					
Newsprint	August	509	2.2	5,966	3.1
Uncoated groundwood (s)	August	149	17.3	1,591	4.5
Coated paper (s)	August	644	7.9	7,421	10.1
Uncoated free sheet (s)	August	966	1.6	11,332	4.7
Other printing/writing	August	122	5.2	1,504	10.3
Total packaging and other paper (s)	August	429	3.1	5,160	2.3
Tissue	August	460	0.7	5,454	3.7
Total paper	**August**	**3,278**	**3.6**	**38,428**	**5.0**
Unbleached kraft paperboard	August	1,666	-0.2	19,438	3.2
Semichemical medium	August	494	2.7	5,718	1.8
Bleached paperboard	August	395	-0.5	4,511	1.1
Recycled paperboard	August	730	-2.9	8,863	5.0
Total paperboard	**August**	**3,285**	**-0.5**	**38,530**	**3.1**
Total U.S. paper and paperboard output	**August**	**6,563**	**1.5**	**76,957**	**4.0**
PULP, WASTEPAPER & FIBER[2]					
Total U.S. woodpulp production	July	5,212	2.0	60,977	3.0
Market pulp production	July	728	-0.1	8,362	4.5
Wastepaper consumption at paper/board mills	July	1,523	1.0	18,827	4.6
Pulpwood consumption (cords)	July	7,901	-3.6	95,301	1.4
CONVERTED PRODUCTS STATISTICS[3]					
Corrugated box shipments (billion ft²)	August	26.878	7.3	205.038[6]	3.7
Containerboard inventories at U.S. box plants and mills	Aug. 1	2,725	9.1		
INTERNATIONAL TRADE[2]					
U.S. paper imports (including products)	July	1,048	4.4	12,817	3.7
Imports of Canadian newsprint	July	708	8.3	8,562[6]	-1.4
U.S. paper exports (including products)	July	431	-1.1	5,718	11.1
Exports of unbleached kraft linerboard	July	168	-9.7	2,139	-5.0
Exports of woodpulp	July	392	-15.3	5,314	9.4
Norscan pulp inventories[4]	Aug. 31	845	-19.4		
Norscan pulp operating rates[4]	August	100%	102%	96%	99%
CANADIAN STATISTICS[5] *(reported in metric tons)*					
Total newsprint shipments	August	847	7.9	6,516[6]	1.7
Operating rates	August	100%	98%	99%	97%
Inventories held by U.S. consumers	Aug. 31	1,605	10.2		
Other paper/board shipments	August	560	4.1	4,463	5.9
Woodpulp shipments (export only)	August	660	-3.4	5,382	1.3
Operating rates	August	99%	99%	97%	98%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

Kraft paper: Bleached and multiwall grades show strength, but grocery sack paper continues slide

Grade Structure: Kraft packaging paper is normally divided into four end uses: bag and sack, shipping sack, wrapping, and other converting. Bag and sack paper is the largest category, accounting for about 61% of total shipments, and is followed by multiwall shipping sacks, 24%; converting, 12%; and wrapping, 3%. Basis weights for bag and sack paper range from 30 lb to 80 lb/3,000 ft², with the lower basis weights used for small grocery and merchandise bags, while 70-lb paper is commonly used for grocery carry-out sacks. Multiwall shipping sack paper is 50 lb or 60 lb. Extensible or air-dried kraft paper may be used for shipping sacks requiring extra strength.

Production/capacity: Unbleached kraft paper (UKP) shipments declined 6.9% to 3.1 million tons in 1987, led by a 13.8% decline in grocery bag and sack paper shipments. Although shipments of kraft paper dropped sharply, operating rates remained high since most of the swing machines in the industry produced a substantial amount of linerboard, thus eliminating any excess capacity. Because many of these swing machines produced more linerboard than kraft paper, the actual kraft paper capacity of the industry is likely to be less than shown in the American Paper Institute's annual capacity survey. Total bleached kraft paper shipments remained flat at about 485,000 tons.

For the first eight months of 1988, UKP shipments were only 2.8% lower than the year before. While grocery bag and sack shipments continued declining, shipments of multiwall shipping sack paper showed a strong gain. Operating rates have exceeded 95% during most of the year because linerboard markets have remained firm. Also, Gilman Paper Co. converted 86,000 tons of UKP capacity to bleached paper at its St. Marys, Ga., mill this year.

Shipments of bleached and specialty grades of kraft paper were flat in 1987 but have improved this year. Production of bleached and specialty grades is up nearly 8% in the first eight months, and the markets have been extremely tight. The outlook for these grades is very good, and several companies, in addition to Gilman, have announced expansion plans to capitalize on these markets. Longview Fibre Co. plans to build a new 100,000-tpy kraft paper machine at its Longview, Wash., mill to produce both bleached and unbleached lightweight bag and specialty kraft paper grades by late 1989. Champion International plans to rebuild its 100,000-tpy specialty bleached kraft paper machine at Pensacola, Fla., in 1989 to focus on lightweight grades.

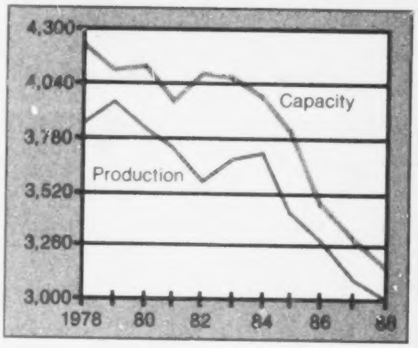
Market segments: Grocery bag and sack paper shipments are expected to drop about 7% in both 1988 and 1989. In 1987, volume was about 1.7 million tons. Losses to plastics continue because plastic grocery sacks sell at about a 50% discount to kraft paper sacks and now account for 40% to 50% of the total volume of bags and sacks used in supermarkets. Shipments of other bags and sacks declined about 12% in 1987 to 80,000 tons, and losses in 1988 and 1989 should be 10%. Kraft paper still retains an important market niche in small retail and fast-food carryout bags.

Multiwall shipping sack paper volume increased about 5% to 785,000 tons in 1987 and is expected to increase 8% in 1988, reflecting strength in the country's agricultural, construction, and industrial markets. Economic uncertainty about 1989 could result in slightly lower shipments of multiwall paper next year.

Pricing: UKP prices have tracked linerboard prices quite closely during the past two years. Producers raised prices $30/ton for grocery and multiwall paper and $15 to $20 for lightweight grades in the first quarter of 1988. Prices are not expected to increase again until early 1989. Heavyweight (70-lb) grocery sack paper prices are currently $455 [illegible] $465/ton. Multiwall (50-lb) kraft paper prices are $510 to $520/ton.

Year-end price history for [illegible]-lb grocery sack paper: 1980, $28[illegible]; 1981, $300; 1982, $240; 1983, $280; 1984, $330; 1985, $300; 1986, $365; 1987, $400. Multiwall sack paper (50-lb): 1980, $375; 1981, $405; 1982, $360; 1983, $390; 1984, $410; 1985, $360; 1986, $400; 1987, $460.

SUPPLY/DEMAND (000 tons)



FORECAST (000 tons)

	1987	1988e	1989e
Shipments	3,075	3,000	2,880
Capacity	3,270	3,150	3,000
Utilization rate	94.0	95.2	96.0
Imports	168	165	155
Exports	89	100	95
Apparent U.S. consumption	3,154	3,065	2,940
lb/capita	25.9	25.0	23.0
GNP ratio[1]	0.82	0.78	0.72

e = Estimate.

1. 1,000 tons/billion $ real GNP.

TOP U.S. PRODUCERS (000 tpy)

	Annual capacity	Market share (%)
1. Stone Container	773	24.5
2. Union Camp	477	15.1
3. Georgia-Pacific	340	10.8
4. Longview Fibre	325	10.3
5. Gaylord Container[1]	270	8.6
6. International Paper	260	8.3
7. Champion International	195	6.2
8. Chesapeake	115	3.7
9. Port Townsend	100	3.2
10. Gilman[2]	73	2.3

Market share of top five companies:
69.4%
Market share of top ten companies:
93.0%
Total U.S. capacity (1988):
3.150 million short tons

1. Reflects merger of Gaylord Container and Mid-America Packaging.
2. Converted 86,000 tpy from unbleached to bleached kraft paper.

to be divided between business papers, forms, and offset grades. Planned average speed on 38-lb is 3,000 fpm, and the drive and machine components are balanced for 3,500 fpm. Wire width is 348 in., with a winder trim of 314 in. Overall average efficiency is expected to be 83%.

The planned filler content of the alkaline-size sheet is 11%; however, the system is capable of producing a sheet up to 18% content. The main filler is PCC. Three high-density chests—two 300-ton for separate storage of hardwood and softwood and one 400-ton for transition pulp—store furnish from the pulp mill. Since the single-line pulp mill swings between hardwood and softwood (typically ten days on softwood and five days on aspen), it is necessary to supplement the machine furnish with baled pulp. A bale pulper was installed in the new paper warehouse for this purpose.

The Valmet Sym-Former forming section is conventional. The headbox is Valmet's Sym-Flo design. After

Demand for uncoated free-sheet grades to grow faster than capacity

Rising demand for office papers is expected to continue to push up production of uncoated free-sheet grades at U.S. mills, which grew 5.5% in 1987 from a year earlier. This is a slower but still healthy growth following the higher 7.7% increase in 1986.

Demand will be strong in the major uses (office bond, forms bond, reprographic, tablet, and envelope), printing papers (offset, cover, and text), and miscellaneous (technical, papeterie, or colored school). Gene Cartledge, chairman and CEO of Union Camp Corp., said recently that the company expects demand for uncoated business grades to grow in the range of 400,000 tpy to 500,000 tpy for the next decade. Many producers such as Union Camp, Weyerhaeuser Co., and George-Pacific Corp. are bringing large machines online over the next few years. Capacity grew 4.5% in 1987, according to the American Paper Institute, which expects about half that growth in 1988.

Domtar Inc., Windsor, Que., brought online its first of two 230,000-metric-tpy machines in 1987. The second machine will be completed in early 1989. This year Weyco brought online its own 210,000 metric-tpy machine in Prince Albert, Sask.

In the U.S., capacity gains have come through even larger expansions, including G-P in Port Hudson, La., (290,000 tpy); Hammermill Paper Co., which brought up a new machine at its Riverdale mill in Selma, Ala., in 1986 and is adding another 45,000 tpy through machine speedups; Champion International's conversion to 260,000 tpy of uncoated free-sheet in Pensacola, Fla.; and Union Camp's decision to go ahead with installation of a second paper machine at Eastover, S.C. The 235,000-tpy machine is scheduled for completion in mid-1991. Capacity of the first paper machine will be increased to nearly 300,000 tpy. Total cost of the Union Camp project, including pulp mill expansion, is expected to reach $650 million to $700 million.

In addition to Domtar's second Windsor machine, 1989 startups include Canadian Pacific Forest Products Ltd. (formerly Great Lakes Forest Products Ltd.) in Dryden, Ont., (170,000 metric tpy) and G-P's second 290,000-short-tpy machine at Port Hudson. Also,

New U.S. and Canadian uncoated free-sheet capacity through 1992.

Company, U.S.	Location	Annual capacity (short tons)	Year
Georgia-Pacific Corp.	Port Hudson, La.	290,000	1988
International Paper Co.	Various	350,000	1988-90
Wiilamette Industries Inc.	Ben[illegible]ttsville, S.C.	200,000	1990
Champion International[1]	Quinnesec, Mich.	58,000 net	1990-91
Boise Cascade Corp.	International Falls, Minn.	300,000	1990
Union Camp Corp.[2]	Eastover, S.C.	60,000	1991
Union Camp Corp.[3]	Eastover, S.C.	240,000	1991
Great Northern Nekoosa Corp.[4]	Ashdown, Ark.	300,000+	1990
Weyerhaeuser Paper Co.[4]	Columbus, Miss.	200,000	n.a.
Bowater Southern Paper Co.	Calhoun, Tenn.	Under study	n.a.
Company, Canada		**(metric tons)**	
Weyerhaeuser Canada Ltd.	Prince Albert, Sask.	217,000	1988
Domtar Inc.[5]	Windsor, Que.	160,000	1989
Canadian Pacific Forest Products Ltd.	Dryden, Ont.	175,000	1989
Makin Pulp & Paper Ltd.[2]	Britannia Beach, B.C.	135,000	1989

North American capacities, 1988: **U.S.**—11.780 million short tpy: **Canada**—915,000 metric tpy (estimated).

n.a. = Not available or not applicable.

[1] Initially will produce uncoated free-sheet but is designed for coated.

[2] Capacity increase on No. 1 paper machine.

[3] New lightweight paper machine.

[4] Machine announced or discussed in principle but plans not finalized.

[5] During 1986-89 period, Domtar will also be shutting down 97,000 tpy of old machines.

[6] Uncoated free-sheet and coated free-sheet.

Sources: *Pulp & Paper Week* estimates, American Paper Institute, Canadian Pulp & Paper Assn.

the headbox is a short preforming table, followed by a twin-wire section equipped with a 49-in.-dia open forming table roll for upward dewatering and a multi-foil shoe with high- and low-vacuum compartments for downward dewatering. Four flatboxes, the couch, and wire drive rolls follow on the lower wire.

The sheet is transferred via a 40-in.-dia suction pickup roll to the Sym-Press O-QF section (the "QF" designation stands for quick felting). Both the pickup roll and the 53-in.-dia bottom first press rolls have VK-A378 duplex stainless steel alloy shells. The bottom press roll is rubber-covered and loaded against a Valmet deflection-compensated (swimming), 38.5-in.-dia Sym-Roll, also rubber-covered and equipped with integral gear drive.

The second and third nips consist of additional Sym-Rolls loaded against a 67-in.-dia, granite center roll. Following the third nip is a very short open draw, and the sheet is conveyed to the dryer section with Valmet

International Paper Co. and its Hammermill unit will increase capacity 350,000 tpy through speedups and rebuilds, and Mohawk Paper Mills Inc. will add 15,000 to 20,000 tpy at its Cohoes and Waterford, N.Y., mills.

Outlook still positive. Operating rates at uncoated free-sheet mills are expected to remain between 93% and 96% through the end of 1988 and the first half of 1989. Many analysts are predicting two- or three-percentage-point declines in the second half of 1989, primarily due to an expected economic downturn.

Demand will remain strong through the first half of next year. However, inventory building in response to announcements of price increases will slow some orders.

Imports are expected to advance slightly in 1938 from 1987 but not as much as in 1989, when uncoated free-sheet imports could rise over 35%, compared with an estimated 10% in 1988, sources said.

Pricing continues upward trend. All grades of uncoated free-sheet paper underwent price increases in 1967 and 1988. These increases brought the significant grades of paper—forms bond and offset—to levels at or above their highs of 1984. Most buyers and sellers expected the latest increases to hold and paper to sell near list prices.

Forms bond producers raised their list prices by $50/ton for shipments in October. The hike was led by James River Corp. and followed by Mead Corp. and G-P. The increase put 15-lb forms bond at about $910/ton. Related paper grades rose, including one-time carbonizing (OTC) tissue, which increased approximately 5% to 6% on Oct. 17. Forms bond sold for $753 list in 1981, dropped in 1985 to $600/ton, and then began a steady rise again. Other grades of uncoated free-sheet paper not already slated for price increases could be the subject of additional hikes based on fourth-quarter pulp price hikes.

Markets are expanding. The best markets for uncoated free-sheet grades are bond, mimeo, duplicating, and reprographic (BMDX), which account for 24%; forms, 21%; offset printing, 25%; envelope, 11%; tablet, 4%; carbonless, 6%; and other, 9%.

In 1987, slightly more than 2.7 million tons of uncoated offset paper were produced in the U.S. Shipments to book publishers were 560,000 tons, or 60% of the 930,000 tons of paper shipped to book publishers. In contrast, uncoated groundwood represented 7.5%, and coated grades accounted for 32%.

Actual consumption of uncoated free-sheet paper for books rose a dramatic 25.2% from 1982 to 1986, slightly higher than the 24.9% gain made by coated papers and in strong contrast to uncoated groundwoods, which fell 15.8% during those years. However, uncoated free-sheet experienced a small 1.7% decline from 1986 to 1987, while coated free-sheet gained 1% and uncoated groundwood gained almost 2.5%.

Shipments to commercial printers of offset and other uncoated free-sheet paper gained more than 8% in 1987 from a year earlier. This compares with coated, which gained more than 15%, and uncoated groundwood, which lost 14%.

Demand for cover and text grades—heavier than offset grades—has grown by about 4.1%/year since 1980, reaching somewhere near 300,000 tons in 1987. Text papers represented about 65% of this market, at over 190,000 tons in 1987. Also in 1987, annual shipments of bond and writing were 2.6 million tons, a healthy 10.5% increase from the year before.

Use of computer printers is expected to continue to grow as a major market for cut-size bond and copy papers, though forms bond growth may slow. Richard Norton, director of Imaging Supplies Industry Services and Copying & Duplicating Industry Services for Dataquest Inc., predicts that overall demand for cut-size papers used for computer printers and copy machines will grow 20.6% from 393,000 tons in 1986 to 1 million tons in 1991.

Of cut-size paper end uses, page (laser) printers accounted for about 288,000 tons of paper in the U.S. in 1986 and will rise to 786,000 tons by 1991. Copier paper will post a much slower growth of just 4.0% over the five-year period, from slightly under 2.0 million tons in 1986 to almost 2.4 million tons in 1991.

For non-cut-size paper, use of stock continuous forms will grow at 7%/year, from 1.7 million tons in 1986 to 2.4 million tons in 1991, according to Norton. Its sister paper, custom continuous forms, will show almost zero growth over the five years, staying at about 1.2 million tons used annually, Norton said.

Of all paper shipments in 1987 to U.S. business forms converters, uncoated free-sheet bond represented 92%, reaching almost 2.8 million tons, while uncoated groundwood, at 228,000 tons, made up the balance, except for the minute (0.2%) coated bond. The groundwood segment began to decline at the beginning of the 1980s, falling about 4.5% between 1982 and 1986, and dropped another 6% in 1987. At the same time, uncoated free-sheet for forms rose almost 44%, gaining an additional 3% in 1987.

Also used in multipart continuous forms is carbonless paper. Basestock for carbonless coating represents a market of almost 600,000 tpy. It grew almost 45.4% from 1982 through 1986 and over 10% from 1986 to 1987. In contrast, OTC production was just under 110,000 tons in 1987, down more than 7% from 1986. A major converter expects carbonless papers to move from about 45% of the multipart forms market to at least 60% in several years.

—Rob Galin, News Editor

PULP & PAPER

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(Photo courtesy of Bowater Inc.)

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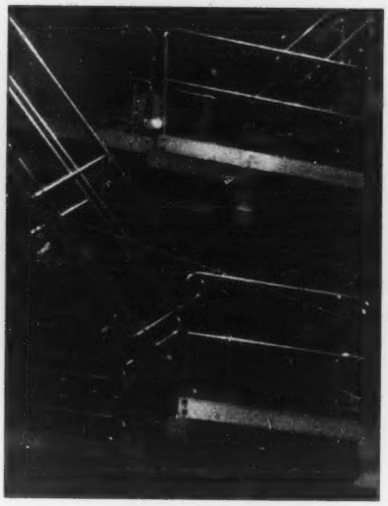

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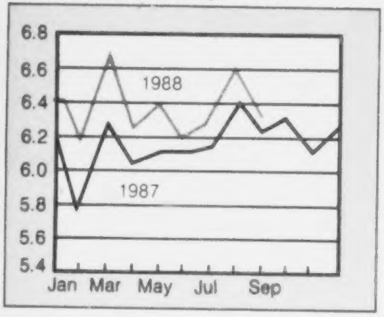
MONTH IN STATISTICS

U.S. paper and board production



Paper and paperboard production totaled 6.3 million tons in September, just 0.6% higher than the same month last year, according to American Paper Institute figures. While production continues at record levels, growth has slowed since the first quarter, and the trend remains flat. Production for the first nine months totaled 57.7 million tons, up 3.7% from last year. After seasonal adjustments, the pace of production for 1988 climbed 3.3% to 76.5 million tpy, with paper up 4.3% and paperboard 2.4%.

Among major grades, printing and writing papers were 6.0% higher through the third quarter, led by continued strength in coated papers. Strong demand for printing papers helped push paper imports above one million tons in August. Fiber box shipments set a record for September and were up 3.4% for the first nine months. Containerboard production for domestic use posted a 3.0% increase, but linerboard exports were down 6.7% through August. Recycled grades were strongest in the paperboard sector.

Canadian newsprint shipments totaled 830,000 metric tons in September, down 2.6% from 12 months earlier. Woodpulp shipments dropped 0.7% to 669,000 tons. Operating rates for September were 96% for newsprint and 88% for pulp. ■

	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION [1]					
Newsprint	Sept.	492	-0.4	5,959	2.7
Uncoated groundwood (s)	Sept.	136	7.9	1,593	4.8
Coated paper (s)	Sept.	595	0.7	7,390	9.1
Uncoated free sheet (s)	Sept.	929	0.1	11,335	4.4
Other printing/writing	Sept.	122	2.5	1,511	9.8
Total packaging and other paper (s)	Sept.	439	4.5	5,201	3.0
Tissue	Sept.	455	1.8	5,471	3.8
Total paper	**Sept.**	**3,167**	**1.3**	**38,460**	**4.7**
Unbleached kraft paperboard	Sept.	1,590	-1.4	19,398	2.8
Semichemical medium	Sept.	472	0.6	5,713	1.7
Bleached paperboard	Sept.	355	3.8	4,482	1.3
Recycled paperboard	Sept.	711	0.9	8,825	4.6
Total paperboard	**Sept.**	**3,127**	**-0.1**	**38,417**	**2.8**
Total U.S. paper and paperboard output	**Sept.**	**6,294**	**0.6**	**76,877**	**3.7**
PULP, WASTEPAPER & FIBER [2]					
Total U.S. woodpulp production	Aug.	5,269	3.7	61,296	3.2
Market pulp production	Aug.	755	6.6	8,452	4.8
Wastepaper consumption at paper/board mills	Aug.	1,615	1.1	18,899	4.7
Pulpwood consumption (cords)	Aug.	7,951	2.9	95,315	1.6
CONVERTED PRODUCTS STATISTICS [3]					
Corrugated box shipments (billion ft²)	Sept.	26.059	0.6	231.255[6]	3.4
Containerboard inventories at U.S. box plants and mills	Sept. 1	2,728	11.9		
INTERNATIONAL TRADE [2]					
U.S. paper imports (including products)	Aug.	1,083	8.0	12,838	4.2
Imports of Canadian newsprint	Aug.	703	4.0	8,546[6]	-0.8
U.S. paper exports (including products)	Aug.	465	-4.3	5,700	8.9
Exports of unbleached kraft linerboard	Aug.	180	-17.8	2,142	-6.7
Exports of woodpulp	Aug.	497	27.4	5,396	11.6
Norscan pulp inventories[4]	Sept. 30	767	-10.4		
Norscan pulp operating rates[4]	Sept.	94%	100%	102%	98%
CANADIAN STATISTICS [5] *(reported in metric tons)*					
Total newsprint shipments	Sept.	830	-2.6	7,346[6]	1.2
Operating rates	Sept.	96%	96%	99%	97%
Inventories held by U.S. consumers	Sept. 30	1,645	9.0		
Other paper/board shipments	Sept.	536	1.1	5,008	5.5
Woodpulp shipments (export only)	Sept.	669	-0.7	6,058	1.2
Operating rates	Sept.	88%	85%	96%	96%

1. American Paper Institute 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized (s) = Shipments.

Newsprint: Industry panic caused by future capacity increases puts pressure on prices

Grade structure: Newsprint is commonly sold in the U.S. is 28-lb to 32-lb, although a slow trend has developed toward the lighter basis weights. Standard newsprint is still considered to be 30-lb. Brightness is in the 55 to 61 range. Of total newsprint consumed in the U.S. in 1987, 75.5% was used by daily newspapers. The remainder was sold to customers that included weeklies, commercial printers, shopping news, and government publications, according to the American Newspaper Publishers Assn.

Production/capacity: Newsprint output remained healthy through much of 1988 but began to ease in the second half as markets both in the U.S. and overseas weakened. U.S. mill shipments through the first nine months of 1988 were up only 1.7% from the previous year, according to the Canadian Pulp & Paper Assn. Canadian shipments through the first three quarters were up 1.2%. At the same time, U.S. consumption was almost flat, up just 0.4%.

Canadian mills supplied 58.6% of U.S. newsprint requirements in the first nine months of 1987, about equal with the 58.5% supply ratio a year earlier, according to CPPA. During the first three quarters, U.S. overseas shipments rose nearly 20% to 262,800 metric tons, while Canadian exports were up less than 1%.

U.S. imports from areas other than Canada dropped 10.6% in 1988 compared with a year earlier and represented 2.3% of total imports through the first three quarters. At the same time, U.S. domestic sources of supply remained flat at about 40%.

Outlook: Industry forecasts indicate newsprint consumption should be up approximately 2% in 1989, but the rapid change in market factors during the last months of 1988 makes it appear likely that these forecasts will be revised to 1% or less. Publishers found ways to cut consumption in 1988 due to high newsprint costs as well as a decline in publishing profits.

North American newsprint capacity will rise by more than 2 million metric tons over the next three years, with two new machines coming online in British Columbia and one in the U.S. South in 1989. This will add more than 600,000 tons to capacity, although the machines will not be running at full speed until 1990. In 1990, five new machines will be starting up, adding approximately another 1 million tons to the marketplace by 1991. In 1991, two more machines will come onstream in Canada, although the shutdown of older units will reduce the net capacity hike to less than 300,000 tons.

The anticipation of excess newsprint capacity by late 1989 or early 1990 caused the industry to panic in 1988. In attempting to lock in customers to long-term supply contracts, mills were offering increasingly larger discounts in the third and fourth quarters. This was expected to erode industry profits in 1989, even if a slated price increase were to be pushed through in the first half.

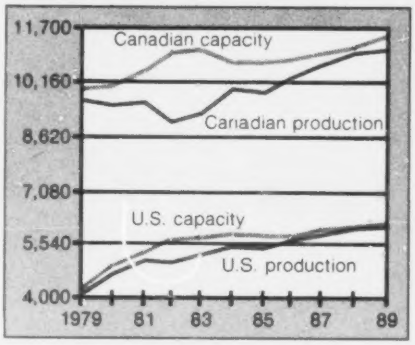
Pricing: After three price increases in 1987 and 1988, newsprint customers began to fight back in late 1988. Newsprint producers' hopes of getting another price hike through before mid-1989 appeared to be dimming toward late 1988. Originally, most of the industry was behind an attempt to raise the U.S. list by $45/metric ton on Jan. 1, but producers later began to roll back and reduce their hikes to $30 for Feb. 1.

Toward the end of the year, discounts for long-term contracts had increased by 3% to 5% in the East, reducing transaction levels to $600 or less. West Coast prices remained firm at about $600, although even that market was slipping by year-end.

Analysts were projecting that transaction prices for newsprint would be flat to down by late 1989 and continue to erode before the next rebound in 1993-95. Even if the list price increase is raised by $30 (to $680/metric ton in the U.S. East) next spring, actual prices will probably be lower than in 1988 due to discounting.

List price history is as follows (U.S. East, contract, year-end, per metric ton): 1974, $259; 1975, $284; 1976, $314; 1977, $331; 1978, $353; 1979, $413; 1980, $441/$470; 1981, $500; 1982, $468; 1983, $500; 1984, $535; 1985, $535; 1986, $500; 1987, $570; 1988, $600.

SUPPLY/DEMAND *(000 tons)*



FORECAST *(000 tons)*

U.S.	**1986**	**1987**	**1988e**
Production[1]	5,842	5,960	6,035
Capacity[1]	5,941	6,013	6,200
Utilization rate	98.3	99.1	97.3
Apparent U.S. consumption	14,547	14,550	14,554
lb/capita	119.7	118.6	117.8
GNP ratio	3.78	3.65	3.57
Canada			
Production[2]	10,663	10,961	11,098
Capacity[2]	10,935	11,199	11,607
Utilization rate	97.5	97.9	95.6

e = *Pulp & Paper* estimate.

1. American Paper Institute.

2. Canadian Pulp & Paper Assn.

TOP U.S. PRODUCERS *(000 tpy)*

	Annual capacity		**Market share**	
Company	**U.S.**	**Canada**	**Total**	**(%)**
1. Abitibi-Price	385	1,835	2,220	12.9
2. Canadian Pacific[1]	—	1,641	1,641	9.5
3. Bowater[2]	1,017	240	1,257	7.3
4. Fletcher[3]	—	1,036	1,036	6.0
5. ConBath	—	1,036	1,036	6.0
6. Kruger	—	873	873	5.1
7. Champion	865	—	865	5.0
8. K-C[4]	435	382	817	4.7
9. Boise[5]	550	263	813	4.7
10. MacBlo	—	804	804	4.7

Market share of top five companies:
41.8%
Market share of top ten companies:
66.0%
Total North American capacity (1988):
17.212 million tons

1. Company formed by merger of CIP Inc. (100% owned) and Great Lakes Forest Products Ltd. (54.3% owned) in 1988. 2. Includes Catawba Newsprint Co. (51.0% owned) and Bowater Mersey Paper Co. Ltd. (51.0% owned). 3. Combined operations of Crown Forest Industries (100% owned) and British Columbia Forest Products Ltd. (69% owned) in 1988. 4. Includes Soruce Falls Power & Paper Co. Ltd. (50.5% owned). 5. Includes Boise Southern Co., DeRidder, La.

SALES & EARNINGS

U.S. paper industry profits surge 48.2%

The U.S. pulp and paper industry enjoyed third-quarter earnings 48.2% above year-earlier levels on a 10.4% improvement in sales, a survey of 30 companies by *Pulp & Paper* revealed. This follows a 40.8% jump in profits in the second quarter. As the industry rolls into the fourth quarter with operating rates high and prices firm, many company executives are predicting another year of record-breaking profits.

International Paper Co. racked up a 97% increase in earnings over third quarter a year ago—the fifth consecutive quarter the company has posted an increase. Chairman and CEO John A. Georges attributed IP's continued strong performance to the packaging materials and white papers businesses. "I see no reason why this trend should not continue through year-end," predicted Georges. The end of the 16-month strike at three IP mills is not expected to have a significant impact on earnings next quarter.

Weyerhaeuser Co. posted a 14.8% improvement in earnings to $144 million, but the figure is markedly lower than the $151-million mark reached by the company in the second quarter. George H. Weyerhaeuser, chairman, said the company's pulp and paper operations ran at record levels during the quarter, but Weyco's forest products segment suffered from the extreme fire hazard in the Pacific Northwest that curtailed logging this summer. Housing starts in September were 13.5% lower than the year-earlier level, cutting further into the profits of the forest products segments. Weyerhaeuser said that the company is entering the fourth quarter with strong order files and mills running at or near capacity and with western log inventories being rebuilt.

Georgia-Pacific Corp. experienced a 3.4% decline in earnings to $114 million for the third quarter, which it attributed to weak prices for building products and higher interest costs from a stock-buyback program. "Operating profits in our building products business were down—$120 million in the 1988 third quarter vs an all-time high of $156 million in 1987," said chairman and CEO T. Marshall Hahn Jr.

James River Corp. completed its first quarter in July with record earnings of $56.2 million—a 19% increase over the same quarter last year. Profits were up primarily due to the communication papers, specialty paper, and paperboard packaging businesses. Towel and tissue earnings were relatively flat.

Profits roll in white papers. Champion International Corp. said that its third-quarter results for printing and writing papers "surged as prices for both uncoated and coated free-sheet grades rose and mills ran efficiently." Champion posted an increase of 38% in earnings to $122 million, which it attributed to worldwide growth in demand for its paper products. Champion expects fourth-quarter results to benefit from an Oct. 1 price hike for its free-sheet grades.

Boise Cascade Corp.'s shining star in the third quarter was its paper and

U.S. paper industry results.

Companies	Third quarter ($000) Sales	Change 1988/87	Earnings[1]	Change 1988/87
Boise Cascade Corp.	$1,000,000	0.3%	$71,900	42.7%
Bowater Inc.	348,304	14.9	40,025	73.9
Champion International	1,285,698	7.2	122,386	38.0
Chesapeake Corp.	188,358	5.0	14,286	293.2
Consolidated Paper Corp.	221,767	17.8	34,487	56.5
Federal Paper Board Co.	254,557	7.1	34,708	64.3
Fort Howard Paper Co.	492,515	4.9	45,801	0.0
Georgia-Pacific Corp.	2,400,000	−0.8	114,000	−3.4
P.H. Glatfelter Co.	145,670	20.7	19,701	46.4
Great Northern Nekoosa Co.	937,700	41.1	92,300	65.7
International Paper Co.	2,400,000	20.0	201,000	97.1
James River Corp. (7/24)	1,387,565	17.7	56,222[2]	18.8
Jefferson Smurfit Corp.	308,413	9.1	37,122	42.5
Kimberly-Clark Corp.	1,400,000	12.0	90,500	8.0
Longview Fibre Corp. (7/31)	170,146	17.8	27,826	64.3
Louisiana-Pacific Corp.	482,900	0.4	36,700[2]	−11.4
Mead Corp.	1,174,100	5.7	170,500[2]	75.1
Mosinee Paper Corp.	58,751	5.6	3,093	48.1
Pentair Inc.	203,920	2.7	10,114	121.8
Pope & Talbot Inc.	123,304	8.6	8,479	19.8
Potlatch Corp.	273,706	10.9	28,292	25.2
Scott Paper Co.	1,150,500	11.3	170,700[2]	191.8
Sonoco Products Co.	408,942	18.7	23,393	49.2
Stone Container Corp.	1,022,000	12.7	89,100	100.2
Temple-Inland	454,600	8.5	53,000	38.7
Union Camp Corp.	669,812	11.5	75,052	32.7
Wausau Paper Mills Co. (8/31)	284,240	13.1	16,005	32.9
Westvaco Corp. (7/31)	532,207	10.5	51,809	20.0
Weyerhaeuser Co.	1,959,941	7.7	144,812	14.8
Willamette Industries Inc.	440,999	17.0	38,962	21.9
Total	**$20,760,815**	**10.4%**	**$1,831,775**	**48.2%**

1. Income after taxes from continuing operations, excluding most significant nonrecurring items after taxes in both years when possible.
2. **James River:** 1987 earnings includes a net gain of $5.5 million related to an insurance settlement. **Louisiana-Pacific:** 1987 earnings have been restated to reflect discontinued operations. **Mead:** 1988 third-quarter earnings include a nonrecurring gain of $100.9 million from the sale of Mead's share of Brunswick Pulp & Paper. Third-quarter 1987 earnings include a nonrecurring gain of $42.8 million from the sale of six container plants and Mead's share of a linerboard mill. **Scott Paper:** 1988 earnings include a pretax gain of $117.3 million for sale of Scott's share of Brunswick Pulp & Paper and a $23.8-million charge for early retirement programs and asset writedowns.

paper products segment, which posted a 42.7% jump in earnings for a fifth consecutive quarter of record operating income. Boise's net income of $71.9 million was comparable to the record level of the previous quarter.

Mead Corp. registered a 27% increase in earnings to $69.6 million for the third quarter, before a nonrecurring gain from the sale of Brunswick Pulp & Paper Co. "Demand is strong, operations have been excellent, and the outlook promises more of the same," said Burnell R. Roberts, chairman and CEO.

Consolidated Papers Inc. enjoyed a jump in earnings of 57% from third-quarter 1987. Both increased shipments and price improvements continued to bolster its earnings.

Containerboard profits soar. Stone Container Corp.'s profits surged 100% from third-quarter 1987 following a 150% jump in the second quarter—a record for the company. Stone executives said the increase was fueled by favorable pricing of its linerboard and kraft paper products, increased productivity, and cost reductions. The company said it has reduced the cost of producing paper and board by 8% in facilities acquired in recent years and has called for a $40/ton price increase to take effect Jan. 1, 1989.

Jefferson Smurfit Corp. followed suit with another quarter of record-high earnings. A strong performance from Smurfit's 50%-owned affiliate, Container Corp. of America, helped boost profits 43% over year-earlier levels. CCA's profits, which also shattered previous records, helped to offset the strike at the company's two Oregon newsprint mills, which began July 6 and 7.

Great Northern Nekoosa Corp. enjoyed a 66% increase in earnings for the quarter, and chairman William R. Laidig predicted 1988 will be another outstanding year. He attributes the healthy improvement to a 20% increase in shipments of pulp, paper, and containerboard from levels of a year ago.

Federal Paper Board Inc. reported a 64% increase in earnings on record third-quarter sales of $255 million. Price increases in pulp and improved productivity in the bleached board, recycled board, and folding carton segments helped to offset the costs incurred due to the startup of equipment at the Augusta, Ga., mill and problems with the Riegelwood, N.C., mill's pulp dryer. ■

Canadian earnings increase despite bloated dollar

Canadian forest products companies enjoyed a 20.4% increase in profits on a 5.5% increase in sales during the third quarter. For most of the quarter, producers continued to grapple with the strong Canadian dollar. But exchange rates may be less of a problem in the fourth quarter because the Canadian dollar weakened when the public became dissatisfied with the Free Trade Agreement.

In the third quarter, the average value of the Canadian dollar in relation to the U.S. dollar was $0.06 higher than a year ago. However, producers profited from tight supply and rising prices for pulp, although newsprint markets began to soften in the third quarter. The slowdown in North American housing starts continued to curtail demand for lumber.

Noranda Forest Inc. reported that although earnings improved 13.8% from third-quarter 1987, the strong Canadian dollar continued to reduce profits. Additionally, the wood products operations were off thanks to weak market conditions and low operating levels. But strong pulp and paper markets have continued into the fourth quarter, and the outlook for the rest of the year is "very encouraging."

MacMillan Bloedel Ltd.'s earnings dropped 14.8% in the third quarter due to a number of factors, including the scheduled shutdown of the company's Harmac pulp mill. A prolonged fire season led MB to curtail production and complete maintenance programs at several of its sawmills. MB's capital construction projects are on schedule, and it is looking forward to improvements in earnings once these are completed.

Abitibi-Price Inc. reported an improvement in earnings of 34.8% for the quarter. Bernd K. Koken, chairman and CEO, said the increased profits in the often seasonally slow period for paper demand were achieved because of higher operating rates and price improvements. "We expect our paper mills to continue to operate at capacity for the balance of the year," Koken said, "and we anticipate that 1988 will be a record earnings year."

Canadian Pacific Forest Products Ltd. posted a strong 61.9% jump in earnings on sales of $766 million. The company expects to begin construction in the fourth quarter on its $105-million thermomechanical pulp mill at Thunder Bay, Ont.

Domtar Inc. reported that earnings dropped about 22.9%, primarily due to interest that was expensed rather than capitalized following the start of commercial production of the Windsor, Que., rehabilitation project. The construction materials group experienced a significant decline because

Canadian paper industry results.

	Third-quarter earnings (C$000)			
Companies	**Sales**	**Change 1988/87**	**Earnings[1]**	**Change 1988/87**
Abitibi-Price Inc.	$813,400	8.5%	$44,500	34.8%
Canadian Pacific	766,000	10.5	92,600	61.9
Canfor Corp.	268,900	−15.7	31,900	2.6
Cascades Inc.	138,816	8.4	15,986	180.2
Consolidated-Bathurst	595,500	6.8	61,600[2]	35.1
Domtar Inc.	684,000	5.1	27,000	−22.9
Donohue Inc.	158,500	36.4	17,000	91.0
Fletcher Challenge	351,100	−1.4	40,100[2]	16.6
MacMillan Bloedel Ltd.	624,400	0.9	70,500	−14.8
Noranda Forest Inc.	1,143,000	2.7	66,000	13.8
Repap Enterprises Inc.	260,100	17.9	23,300	36.3
Rolland Inc.	110,200	16.2	2,007	1,455.8
Scott Paper Ltd.	81,195	9.7	4,573	11.5
Weldwood of Canada	232,600	15.3	17,800	21.9
Total	**$6,427,711**	**5.5%**	**$514,866**	**20.4%**

1. Income after taxes from continuing operations, excluding significant nonrecurring items in both years when possible.
2. **Consolidated-Bathurst's** year-ago earnings of $45.5 million do not include an extraordinary gain of $28.8 million. **Fletcher Challenge Canada's** results do not include Crown Forest Industries results.

of lower gypsum board prices and shipments. The company said this was offset by improved performances in the pulp and paper products and packaging groups.

Consolidated-Bathurst Inc. reported record earnings that were 35.1% higher than third-quarter 1987. With the exception of Europa Carton, all of the company's operating units posted gains for the quarter. The pulp and paper group contributed significantly to the overall earnings boost, posting a healthy 28% jump from a year ago.

Fletcher Challenge Canada Ltd. president and CEO Ian Donald said the company's earnings increase of 16.6% was driven primarily by excellent market conditions for pulp and coated paper, which helped to offset softer newsprint demand and generally depressed prices for wood products during the third quarter. Higher earnings from associate companies also contributed $18.1 million to pretax income. "If present conditions continue, and barring any dramatic shift in world economies, the company is on target for another record year," Donald said.

Repap Enterprises Corp. Inc. reported that earnings rose 36.3% from third-quarter 1987. Chairman George Petty said inventories of premium-grade softwood kraft pulp are at their lowest level in 14 years and customer demand is continuing to strengthen.

Rolland Inc. racked up a 1,455.8% leap in earnings, shattering its third-quarter results a year ago. A company spokesman attributed the jump to higher selling prices for its fine papers, a better grade mix, and improved mill efficiency. ■

International Paper to up capacity 5% at Georgetown

International Paper Co. is planning to spend more than $50 million to increase combined pulp and paper capacity by 5% at its Georgetown, S.C., mill. Work is scheduled for completion in fourth-quarter 1989.

The project will increase capacity for bleached kraft pulp, which is currently estimated at 1,600 tpd. About 915 tpd is market pulp, including fluff pulp. In addition, capacity for the Springhill line of uncoated white papers will be increased. Capacity is now estimated at 370 tpd.

Improvements will also be made to the woodyard, power plant, and environmental systems related to the power plant. In 1984, IP completed a $500-million conversion of the mill from linerboard to uncoated white papers and market pulp. ■

EXPANSIONS

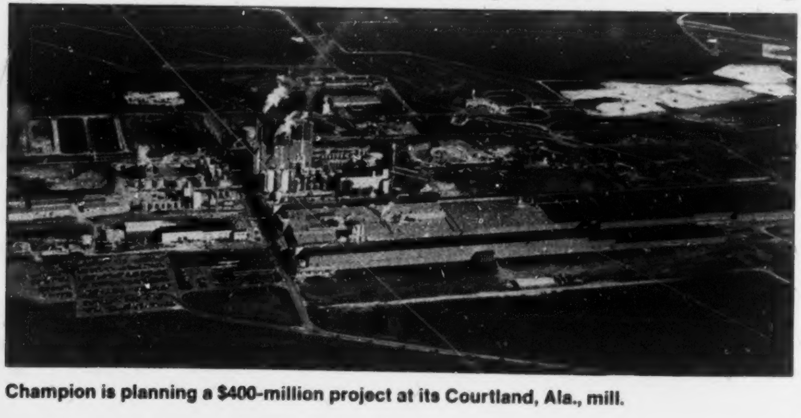
Champion plans $800-million modernization

Champion International Corp. told financial analysts it plans to spend about $800 million annually over the next four years for various cost-reduction, environmental, and capacity expansion projects. In 1989, the bulk of the funds will go toward the projects under way at the Hinton, Alta., and Quinnesec, Mich., pulp mills, said spokesman Robert Turner. In addition, the company plans to begin rebuilding the four paper machines and the pulp operation at Courtland, Ala.

Work at Courtland is actually a series of projects that would increase pulp capacity by 250,000 tpy, increase printing/writing paper capacity by 140,000 tpy, and add a cogeneration facility, Turner said. Work is expected to begin in summer 1989 and cost about $408 million over the four years it would take to complete all of the projects. Champion currently has capacity to produce about 550,000 tpy of coated and uncoated paper at Courtland and 465,000 tons of bleached softwood and hardwood kraft pulp (of which about 95,000 tpy is market pulp).

Champion is still waiting for final permits for work at its Canton mill, which produces uncoated free-sheet and bleached paperboard. Plans call for cost-reduction and environmental compliance projects.

The projects are expected to be financed internally, except for about $150 million from outside sources for work at Hinton, where pulp capacity is being doubled. ■



Champion is planning a $400-million project at its Courtland, Ala., mill.

Alcan secures chip supply, seeks partners for mill

Alcan Aluminum Ltd. moved one step closer to building a pulp and paper mill in Vanderhoof, B.C., by signing an agreement with Sinclar Enterprises Ltd. of Prince George, B.C., and its group of sawmills. Sinclar Group operates four sawmills in the Vanderhoof/Prince George area (The Pas, L&M Sawmills, Lakeland, and Apollo) that generate about 250,000 bdu/year of high-quality spruce, pine, and fir chips. It also has long-term cutting rights on public timber in the Interior. In return for agreeing to provide woodfiber to the proposed mill, Sinclar will get an equity stake in the project. As in the Fibreco project, the Alcan mill will give British Columbian sawmills an entree into a value-added product area.

Alcan said the grade of pulp and/or paper produced at the mill will depend on which company becomes an equity partner in the project.

The mill will have a long-term supply of electricity from Alcan's hydroelectric plant in Kenamo. This plant produces excess power that it sells intermittently to B.C. Hydro. Given this setup, Alcan's prefeasibility studies show the site is best suited for newsprint or other mechanical pulp and energy-intensive papermaking. Chemi-thermomechanical pulp or pressurized groundwood pulp are also possibilities. The mill may also use aspen in its furnish. ■

Fibreco Export starts up second CTMP line

Fibreco Export Inc.'s deadline for submitting final plans for what would be its second greenfield mill in British Columbia was recently extended by the provincial government to Jan. 31 from Oct. 31, according to Tony Jarrett, president.

In November, Jarrett said that the second pulping line was in the middle of its startup at the new Taylor, B.C., bleached chemi-thermomechanical pulp (CTMP) mill and that "commercial quality" shipments were being made with output from the first line.

Fibreco was one of three bidders awarded timber cutting rights in British Columbia for a tentative proposal to build another CTMP mill—possibly integrated with some type of paper—near the existing Taylor mill. The British Columbian government already approved plans of Makin Pulp & Paper Ltd. and Louisiana-Pacific Corp.

Commercial shipments from the second line are expected to start by December, and, by the beginning of 1989, total mill output is slated to be for "long-term contract" shipments. Until that time, customers will be on "short-term basis" shipments to determine if the quality meets their requirements, he noted. ■

ACQUISITIONS/MERGERS

L-P decides against acquiring Doman

Doman Industries Ltd. said in November that it was advised by Louisiana-Pacific Corp. that L-P will not proceed with its proposed acquisition of Doman. No reason was given for the decision. L-P said in October that it would buy shares of Doman it didn't own for about US$200 million in cash. L-P owns 10.6% of Doman's stock. The decision not to proceed with the buyout quells speculation that L-P was angling to acquire Western Forest Products, in which Doman holds about a 20% stake.

- FH Acquisition has completed the leveraged buyout of Fort Howard Corp. by paying shareholders $53 in cash per share. Shareholders approved the transaction and merger last month. Separately, Fort Howard made a debt offering of $1.713 billion through Morgan Stanley & Co. ■

FINE PAPERS

Consolidated to install specialty paper machine

Consolidated Papers Inc. plans to install a new paper machine at its Stevens Point, Wis., specialty mill to produce lightweight coated specialty papers for consumer packaging and labels. The 180-in.-wide yankee fourdrinier machine will have capacity of about 160 tpd, or 59,000 tpy, and will be capable of running at speeds up to 3,000 fpm. It will be supported by a new gas-fired boiler, expanded and automated coating makedown facilities, a new automated roll-wrapping system, and expanded wastewater treatment facilities.

The $110-million project was approved by Consolidated's board of directors and represents the major part of the company's capital budget for 1989. Pending approval of air and wastewater permits from the Environmental Protection Agency and the state of Wisconsin, groundbreaking is planned for early 1989 with project completion scheduled for late 1990. The new machine will be constructed on the west side of the existing mill and will at least double output of specialty papers, which should reach 56,000 tons this year.

Meanwhile, Consolidated Papers officially started up its rebuilt No. 14 coated free-sheet paper machine at Wisconsin Rapids, Wis., on Oct. 25. The $63.2-million project increased machine capacity by 10,000 tpy. ■

Business forms industry facing challenges

U.S. forms makers can expect their industry to continue growing, but they face several competitive challenges along the way, according to an industry association report.

Forms industry sales growth is expected to be about 4.7% this year over 1987, about the same as the previous year's growth, which was the best performance since 1984.

The annual report, "Perspective '88," a study on the present and future of the North American forms industry, was compiled by Douglas C. Taylor, director of economic and market research for International Business Forms Industries Inc. (IBFI).

Taylor said that custom and stock continuous forms will remain the industry's fastest-growing segments but the growth in cut-sheet papers exceeds that of the forms industry as a whole. Cut-size (usually 8½-in. × 11-in.) demand is being fueled by reprographic and page printers use.

In 1987, custom continuous sales grew by 6.1% and stock continuous sales by 3.8%. Custom forms account for about 40% of total industry sales. Unit sets advanced 2.8%, while the relatively small sales books and pegboard segments were up 6.8%.

Also growing substantially is carbonless paper, which is advancing at about 8% to 10% annually—double the forms industry rate. Competition is expanding in the carbonless market, especially with Mead Corp.'s acquisition of Standard Register's carbonless plant in 1987 and James River Corp.'s entry this year, Taylor said.

But forms makers also face competitive challenges, including technological rivalry, demographic changes among forms users, and lowered entry barriers in some market segments.

For further information on "Perspective '88," contact IBFI at 2111 Wilson Blvd., Suite 350, Arlington, Va. 22201, or call (703) 841-9191. ■

U.S. business forms sales, 1987-92 (millions of 1987 dollars).

	1987	1988e	1989e	1990e	1992e
Custom continuous	$3,098	$3,268	$3,363	$3,433	$3,606
Stock continuous	1,628	1,707	1,792	1,847	2,023
Unit sets	1,563	1,605	1,629	1,637	1,692
Sales books, pegboard	331	348	359	383	437
Total	**6,620**	**6,928**	**7,143**	**7,300**	**7,758**

Source: International Business Forms Industries.

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JANUARY

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THE COVER

Pulp & Paper's *exclusive Outlook '89 (p. 48) and Capital Spending (p. 107) reports indicate 1989 will be another banner year for the North American paper industry.* (Photo of construction work on building that will house new newsprint machine being installed at Finlay Forest Industries mill in British Columbia courtesy of Fletcher Challenge Canada.)

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Corrugated consolidation continues

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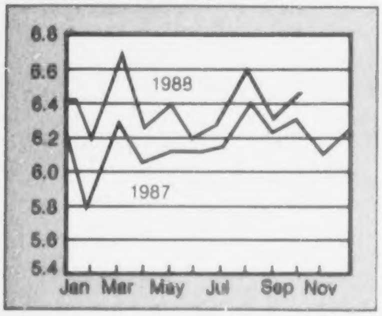
ABP

BPA

MONTH IN STATISTICS

U.S. paper and board production



U.S. production of paper and paperboard totaled 6.5 million tons in October, up 1.2% from the same month in 1987, according to American Paper Institute figures. Despite flat growth for most of 1988, production is expected to set new records for virtually all the major grades. After seasonal adjustments, paper production through October was at a rate of 38.4 million tpy, up 4.2% from 1987, while the paperboard rate was 38.1 million tpy, up 2.3%. Total production should reach a record 76.8 to 77.0 million tons by year end, API reported.

Among major grades, printing and writing papers were up 5.8% through October, led by strong gains in groundwood and coated papers. Production of containerboard for domestic use was up 2.7% through the first ten months, keeping pace with a rise in corrugated box shipments of 3.1% over the same period. U.S. exports of unbleached kraft linerboard rose sharply in September but were still below the 1987 pace for the first three quarters.

Canadian newsprint shipments totaled 803,000 metric tons in October, down 1.0% from 1987, but operating rates at newsprint mills rose to 100%. Woodpulp shipments were off by 1.4%, with mills operating at 92% of capacity for the month. ■

	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION [1]					
Newsprint	Oct.	507	-0.2	5,971	2.4
Uncoated groundwood (s)	Oct.	148	19.4	1,617	6.7
Coated paper (s)	Oct.	617	2.3	7,410	8.6
Uncoated free sheet (s)	Oct.	953	-1.4	11,379	4.1
Other printing/writing	Oct.	124	3.3	1,513	9.6
Total packaging and other paper (s)	Oct.	435	0.0	5,207	2.8
Tissue	Oct.	470	3.3	5,488	3.7
Total paper	**Oct.**	**3,254**	**1.3**	**38,585**	**4.5**
Unbleached kraft paperboard	Oct.	1,582	1.0	19,356	2.6
Semichemical medium	Oct.	472	-0.4	5,707	1.4
Bleached paperboard	Oct.	381	4.4	4,491	1.6
Recycled paperboard	Oct.	776	0.5	8,873	4.3
Total paperboard	**Oct.**	**3,210**	**1.0**	**38,427**	**2.6**
Total U.S. paper and paperboard output	**Oct.**	**6,465**	**1.2**	**77,012**	**3.6**
PULP, WASTEPAPER & FIBER [2]					
Total U.S. woodpulp production	Sept.	5,006	1.6	61,154	3.0
Market pulp production	Sept.	727	6.9	8,482	5.1
Wastepaper consumption at paper/board mills	Sept.	1,537	-0.5	18,836	3.5
Pulpwood consumption (cords)	Sept.	7,956	1.3	95,332	1.6
CONVERTED PRODUCTS STATISTICS [3]					
Corrugated box shipments (billion ft²)	Oct.	27.797	0.2	259.035[6]	3.1
Containerboard inventories at U.S. box plants and mills	Oct. 1	2,667	10.2		
INTERNATIONAL TRADE [2]					
U.S. paper imports (including products)	Sept.	1,108	1.5	12,889	3.9
Imports of Canadian newsprint	Sept.	701	-5.1	8,531[6]	-1.3
U.S. paper exports (including products)	Sept.	509	17.3	5,614	7.3
Exports of unbleached kraft linerboard	Sept.	213	32.3	2,192	-2.8
Exports of woodpulp	Sept.	518	17.2	5,487	12.3
Norscan pulp inventories[4]	Oct. 31	802	-8.3		
Norscan pulp operating rates[4]	Sept.	91%	94%	100%	94%
CANADIAN STATISTICS [5] *(reported in metric tons)*					
Total newsprint shipments	Oct.	803	-1.0	8,148[6]	1.0
Operating rates	Oct.	100%	97%	99%	97%
Inventories held by U.S. consumers	Oct. 31	1,532	6.2		
Other paper/board shipments	Oct.	559	-2.1	5,567	4.7
Woodpulp shipments (export only)	Oct.	646	-1.4	6,704	0.9
Operating rates	Oct.	92%	95%	96%	96%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

TISSUE: Producers try to make hikes stick in wake of escalating pulp prices

Grade structure: Tissue falls into two major groups: sanitary and "other." About 98% of total output is sanitary, including bathroom, facial, toweling, napkins, basestock for sanitary stock, wadding, and wipes. The "other" group includes basestock for waxing, wrapping, and miscellaneous.

The two major markets for tissue are consumer and commercial and industrial (C&I). Consumer tissue is purchased by people at grocery stores, while industrial tissue is bought by hotels, offices, restaurants, hospitals, prisons, and factories. About 38% of U.S. tissue production is C&I, while the larger portion is sold on the consumer market. Typical basis weights for tissue include 12 to 14 lb/3,000 ft² for single-ply bathroom tissue and 32 to 39 lb/3,000 ft² for single-ply towel.

Production/capacity: In the beginning of 1989, the tissue market will be trying to absorb new capacity that came onstream in late 1988 at James River Corp.'s Clatskanie, Ore., mill. The new machine has capacity for approximately 70,000 tpy. James River has still not revealed where or when it will install the two other tissue machines that it said it will bring onstream between 1989 and 1994.

Several new machines are slated for startup in the second half of this year, but the additional capacity should not have much of a downward effect on prices until the fourth quarter. The two largest machines will make recycled tissue. FSC Paper Co., Alsip, Ill., plans to start up an 80,000-tpy machine in October. Most of this machine's output will be sold to converters. Fort Howard Corp. will start up its third recycled tissue machine at its Rincon Ga., mill in late 1989. It is also starting up a dry-form tissue machine at its Green Bay, Wis., mill in the middle of this year.

Outlook: Through the first nine months of 1988, U.S. tissue paper production was running at an annual rate of 5.471 million short tons—a 3.8% increase over the record 1987 level. Unlike most paper grades, demand for tissue paper does not fall off drastically during a recession since consumers view tissue products as a necessity. However, consumers may trade down to lower-quality products or private-label brands. In a recession, C&I producers will fare worse since consumption of this grade is more closely tied to industrial production.

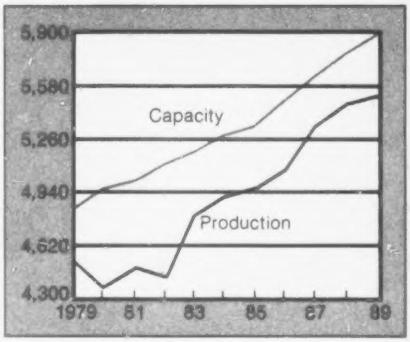
Tissue capacity is expected to remain tight during most of 1989. Barring a recession, producers of commercial tissue will probably try for another price increase in late spring or summer. C&I producers implemented two price increases in 1988—a 5% increase in the spring and a 6.9% increase in the fall. They implemented two increases at the same times in 1987. Producers generally get half of the announced price hikes, so they essentially have raised prices about 6% in each of the last two years.

Last year, producers of consumer tissue got behind their first increase on roll tissue products in about seven years. In April 1988, James River led the price increase attempt by announcing a 9.2% hike on toilet paper, a 5.6% increase on towels, a 5.0% increase on napkins, and a 7.5% increase on facial tissue. The other major producers—Scott Paper Co. and Procter & Gamble Co.—followed. Scott surprised the market in November by announcing that it was raising its prices for all its towel grades and its paper napkins by 5% to 8%, with the average increase being close to 7%. The hike was to be phased in over a three-month period. Scott is the leading U.S. producer of both towels and napkins.

The announced first-quarter domestic increase on market pulp will cut further into profits and could lead consumer tissue producers to try for another increase on toilet paper and facial tissue in the first half.

Prices: Because of the highly competitive market for consumer tissue paper, the price of tissue paper per ton is available only from the producers. Price trends tracked by the Bureau of Labor Statistics' Producer Price Index (PPI) show relative changes in price levels. Note that this is an index and not a dollar-per-ton price. The PPI for converted sanitary paper products, including unconverted stock (1982 = 100): 1980, 91.9; 1981, 98.2; 1982, 100; 1983, 102.1; 1984, 103.4; 1985, 106.6; 1986, 108.1; 1987, 109.1; 1988 (October), 117.5.

SUPPLY/DEMAND (000 tons)



FORECAST (000 tons)

U.S.	1987	1988e	1989e
Production	5,341	5,471	5,511
Capacity[1]	5,635	5,771	5,900
Utilization rate	94.8	94.8	93.4
Imports[2]	55	66	60
Exports[2]	36	57	40
Apparent U.S. consumption	5,298	5,480	5,531
lb/capita	43.6	44.6	45.0
GNP ratio	2.75	2.75	2.76

e = Estimate.

1. American Paper Institute data.

2. U.S. Dept. of Commerce data.

TOP U.S. PRODUCERS (000 tpy)

	Annual capacity	Market share (%)
1. James River	1,111	18.8
2. Scott Paper	1,050	17.8
3. Procter & Gamble	900[1]	15.3
4. Fort Howard	820[1]	13.9
5. Georgia Pacific	537	9.1
6. Kimberly Clark	430	7.3
7. Pope & Talbot	148	2.5
8. Chesapeake	120	1.7
9. Erving Paper Mills	100	1.7
10. APL	95	1.6

Market share of top five companies:
74.9%

Market share of top ten companies:
90.0%

Total U.S. capacity (1989):
5.900 million short tons

1. *P&P* estimate.

sion said the trace quantities of the furan 2,3,7,8-TCDF found in disposable diapers do not present a hazard to children.

Testing of milk accelerated. Later this month, the American Paper Institute, represented at the hearing by president Red Cavaney, will submit to EPA a testing protocol for the industry's study of dioxin in milk packaged in solid bleached sulfate (SBS) cartons. The Food & Drug Administration plans to accelerate testing of milk due to the discovery of trace amounts of dioxin in milk sold in Canada. The tests will be conducted early next year at FDA's lab in Chicago, Ill.

Industry can eliminate concerns. API's Cavaney reiterated that he does not know of a commercially available technology, including oxygen delignification, that could manufacture a broad range of bleached paper products that would totally eliminate dioxin formation.

In December, API announced it has identified ways to eliminate any concerns related to dioxin in the manufacture of bleached paper products using a variety of manufacturing process options. Options include removing more of the precursor components in pulp prior to the bleaching process, strictly controlling the amount of elemental chlorine used, substituting other bleaching agents for some chlorine, and installing or modifying prebleaching processes.

- The province of Alberta is introducing environmental standards for pulp and paper mills that are the strictest in Canada. Effective immediately, the regulations require all new or expanding pulp mills to use "leading-edge technology" to control effluents and chemical contamination of the product. The goal is to "reduce dioxins to an absolute minimum and eliminate them if possible," according to environment minister Ian Reid.

New or expanding pulp mills will be required to install equipment that will extend the first delignification stage. They will also have to install oxygen delignification systems and substitute between 60% and 70% of the chlorine with chlorine dioxide in at least the first stage of conventional bleaching. This makes Alberta the first province to require oxygen bleaching equipment, a process that the Swedish Pulp & Paper Research Institute said reduces the formation of dioxin. ■

CAPACITY

Newsprint capacity growth to hit ten-year high

Capacity increases for some grades of pulp and paper during 1987-90 will be higher than in at least a decade, according to the recently released update of the Canadian Pulp & Paper Assn.'s annual capacity survey. Over the forecast period, market pulp capacity will grow by 2.9% annually, more than twice the rate attained over the 1977-87 period, while newsprint capacity will jump 3.2% annually, higher than recorded in several decades.

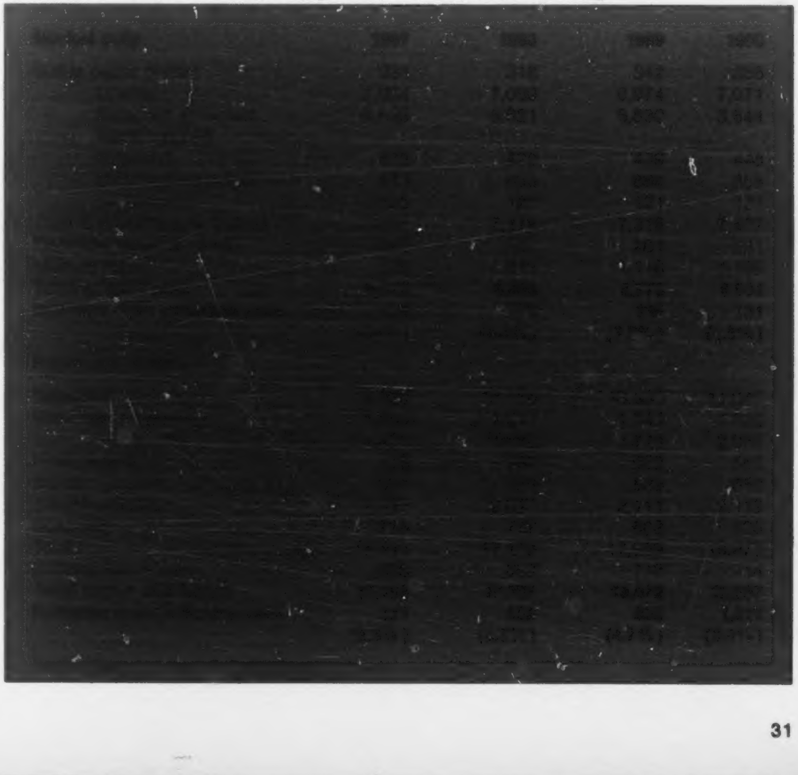
Total paper and board capacity in Canada will increase by 2.5 million metric tons and market pulp capacity will rise by 1.135 million tons, each showing a 14.6% growth over the three-year period. Total pulp capacity will grow 9.8%, or 2.4 million tons, during this time.

Strong mechanical pulp growth. Much of the total pulp growth is the result of gains in mechanical pulping capacity, which will increase at a rate of 6% annually during 1987-90. Four new chemi-thermomechanical pulp (CTMP) mills alone will add 678,000 tons to the total 1.9-million-ton gain expected over the three-year period. Bleached hardwood sulfate pulp capacity will rise by 300,000 tons by 1990, and bleached softwood pulp will go up 357,000 tons during the survey period. Expansions at four mills in Alberta and British Columbia will account for more than 80% of the increase.

Slow growth for kraft pulp. Most of the gain in market pulp capacity is expected to be in the mechanical grades (mainly CTMP). Mechanical pulp, which represented only 7.3% of Canadian market pulp capacity in 1987, will double to 1.2 million tons by 1990, CPPA noted.

Sulfate market pulp capacity will rise by only 67,000 tons, or 1.0%, over the 1987-90 time frame (excluding Daishowa Paper's 350,000-tpy mill in Alberta, which is not scheduled for completion until 1991). This increase translates into an annual growth rate of only 0.3%/year over the 1987-90 period, compared with 1.5% in 1977-87. Bleached softwood sulfate is expected to grow by 111,000 tons, or a total of 2.0%, while semibleached

Canadian industry annual capacity growth, 1987-90 (000 metric tons).



softwood and bleached hardwood grades will decrease by 25,000 and 15,000 tons, respectively, during the three-year period.

Printing/writing surge. On the paper side, newsprint will show major gains in the next three years. Six new machines (including a swing newsprint/groundwood paper machine at Consolidated-Bathurst Inc.'s Grand' Mère, Que., mill), together with some improvements to existing machines, will boost capacity by 1.12 million tons, or 11.3%, between 1987-90 (not included are Kruger Inc.'s 180,000-tpy machine for 1990 or Howe Sound Pulp & Paper's 195,000-tpy machine for 1992).

Groundwood paper capacity is also expected to show significant gains, with a 460,000-ton, or 34%, increase in the three-year period—including St. Marys Paper Inc.'s new supercalendered machine that just started up. Total groundwood paper capacity will reach 1.82 million tons by 1990, up from 1.36 million tons in 1987.

Even more dramatic, though, is the 654,000-ton, or 47%, rise in book, writing, and miscellaneous paper. Total Canadian industry capacity will reach 2.06 million tons by 1990. ■

CONVERTED PRODUCTS

Jefferson Smurfit buys stake in plastic bag firm

Jefferson Smurfit Group plc has acquired a 19.9% stake in PCL Industries Ltd., a leading Canadian producer of plastic carry-out bags and garbage bags, for about C$8.6 million. Smurfit bought the shares privately from Unicorp Canada Corp. through Smurfit Paper Tube Ltd., Kingston, Ont.

In December 1987, Unicorp called off a hostile $8/share takeover bid for PCL under a three-year standstill agreement after acquiring a 25% stake in the company. Unicorp still owns about 5% of PCL after selling most of its interest to Smurfit.

PCL's plastics group reported sales of approximately C$325 million in 1987, and Jefferson Smurfit Corp./Container Corp. of America's plastics packaging division had 1987 sales of about US$75 million. CCA primarily makes industrial plastic drums and containers, as well as fiber drums, at seven plants. PCL has six manufacturing plants. ■

Weyerhaeuser posts milk carton price increases

Weyerhaeuser Corp. announced a schedule of price increases for converted milk cartons that would raise prices by 9.5% on Jan. 2 and by an additional 6.5% on Apr. 1. The price hikes are generally for the pint, quart, half-gallon, and gallon carton sizes. Prices for half-pint cartons, which are primarily used in school lunch programs, will be raised by 12% on July 1, when supply contracts with schools are generally negotiated.

One marketing source estimates that polyethylene coated milk carton stock prices have jumped by a minimum of $175/ton over the past year. Export prices are expected to reach $925 to $1,025/ton in some regions on Jan. 1, and there is always pressure among the integrated producers to charge equivalent prices to domestic milk carton converting operations. Despite these increasing costs, carton prices have lagged board prices. ■

Three new corrugated box plants in the works

Great Northern Nekoosa Corp. broke ground on a new corrugated box plant in Waxahachie, Texas, in September. The new Nekoosa Packaging plant is expected to start up in mid-1989, bringing GNN's total number of box plants to 26.

- Inland Container Corp. plans to spend $7 million to modernize and expand production at its Crawfordsville, Ind., box plant. The project, which will be completed in mid-1989, includes an upgrade of the corrugator, an automated conveyor system, and two additional flexo folder-gluers. The corrugator upgrade will increase its width from 87 in. to 98 in. and allow it to run at up to 1,000 fpm. Meanwhile, Inland has purchased a new 80,000-ft^2 building in Edinburg, Texas, as the site for a new corrugated box plant in the lower Rio Grande Valley. The plant will begin limited operation this spring and will become a full-service box plant by the end of 1989.
- A new 70,000-ft^2 corrugated container plant has been opened by Gaylord Container Corp. in West Liberty, Iowa. Production was expected to begin in early December. The plant will have multicolor printing capability and advanced diecutting equipment for high-quality graphics. ■

Triangle Industries sale marks major consolidation

Triangle Industries Inc. has agreed to sell its American National Can Div. to France's state-owned conglomerate, Pechiney SA, for $1.26 billion. New York-based Triangle, which is the world's largest packaging company, was mainly built through the leveraged buyouts of National Can Co. in 1985 and of the packaging unit of American Can Co. in 1986. Triangle operates 111 packaging plants in the U.S., as well as in Britain, Fed. Rep. Germany, France, and Spain, and it reported sales of $4.4 billion in 1987.

The Triangle sale is the latest in a string of acquisitions of the world's largest packaging concerns and signals a major consolidation in the packaging industry. In November, another French concern, Groupe Carnard SA, took management control of the packaging activities of Britain's MB Group plc in a $1.3-billion transaction that will leave the newly formed group, CMB Packaging SA, Europe's biggest packaging concern, with annual sales of about $3.6 billion. Also in November, the Australian paper and packaging giant, Amcor Ltd., gained a strategic foothold in North America with the acquisition of Canada's Twinpak Inc. ■

PULPWOOD

Export price of Douglas fir chips jumps $11/bdu

The first-half export price for woodchips moving from the Pacific Northwest to Japan has been settled rather painlessly since both sides are cognizant of the growing demand for woodchips and the shrinking supply, an observer said. The price of Douglas fir chips rose $11/bdu from second-half 1988 to $97.70/bdu f.o.b. vessel. The price of red alder chips rose $6/bdu to $117/bdu f.o.b. vessel. Besides the strong demand for woodchips from both offshore and domestic pulp mills, woodchips will be in shorter supply since several older, less-efficient sawmills in the region are closing permanently because of rising log costs, sources report.

If the pace of Japan's woodchip imports in first-half 1988 is maintained, it will have imported about 16 million m^3 of chips in 1988—a 15.7% increase over 1987 levels, according to a report in Japan's *Paper Business Review*. ■

Dyestuff industry healthy; higher prices predicted

CONSUMPTION. Although less enthusiastic about growth in 1988 than in 1987, dyestuff producers maintained their upward rise in sales to the paper industry. Paper industry production grew about 4% last year, while paperboard production rose about 2.5%. This contributed to a wider use of brighteners across all grades, while the heavy consumption of deeper shades also increased.

Suppliers are more tentative about 1989. Most are hoping to maintain markets but expect smaller increases. This attitude is fostered by uncertainty in the economy. "Regionally," an industry source explained, "the upper Midwest will see more new and upgraded paper machines in the coming years than any other area, emphasizing that region's importance as a strong, long-term base for paper manufacturing." The printing industry for publication and other grades is centered here for central shipment to the populous coasts. He continued, "New England will likely be a slower growth area due to the relatively high cost of energy and direct competition from Canadian mills." Paper and paperboard production will continue to increase over the next five years. A report from the Canadian Pulp & Paper Assn. forecasts 4.7% capacity growth for Canada, while the American Paper Institute sees a 2.7% increase for the U.S. The capacity growth is fairly well distributed among grades, with printing and writing products leading the charge. This should help dyestuff consumption into the next century. New tissue and toweling machines, such as the one launched by James River in Oregon (276-in., capacity of 70,000 tpy), should also help consumption by the heavy-user group.

FUTURE DEMAND. Another aid to dyestuff suppliers is the use of mechanical fiber as market pulp. Brightness targets are 10% to 20% less than that of chemical pulp, and users may find dyes to be key in the production of grades using bleached chemithermomechanical pulp (BCTMP) and other less-bright fibers. Also, with the government and other public concerns mandating the use of secondary fiber in their consumables, suppliers are looking at product blends and material to perform dual functions in secondary fiber processing.

Mills are also continuing their use of liquid systems for dye introduction in paper furnishes. Powdered dyes now are nearly all used in certain specialty applications and smaller machines. Mills enjoy the flexibility, readiness, and efficiency of liquid systems and apparently do not mind paying higher prices for the more sophisticated products. Material handling suppliers and process control measurement devices bought by mills are seen as contributors to this trend as well. Reporters to this column also see more alkaline papermaking systems now and in the future and have had to adjust their offerings accordingly. Use of cationic direct dyes will increase with every paper machine conversion. New challenges for suppliers and mills may be on the horizon, as types of furnish changes occur in the 1990s. Returnable, multiuse containers are also becoming an important issue in dye sales and consumption.

PRICE, AVAILABILITY. The U.S. dye industry is about to complete a ten-year cycle that will have seen heavy consumption and rapid growth, a massive industry shakeout (which hit U.S. producers hardest), falling prices, recovery, and perhaps, in today's economic environment and industry infrastructure, stability.

Table 1 shows a snapshot of the industry, but statistics are hard to come by. The supply to paper, plastic, textile, and ink manufacturers will be monitored closely, as dye companies want to avoid the problems in the past of overcapacity, dead-end markets, and another shakeout.

Suppliers are positioning themselves for the future. Some will have problems with production due to a lack of intermediary material. The problem has worldwide implications and will always be a serious issue among producers. Many will have to raise prices for this reason. Another reason for future price increases is the environmental pressure facing producers. One plant (Ciba-Geigy's Toms River, N.J., site) will be closed, but the company plans on opening a new facility in St. Gabriel, La. It also reports that the plant will cost $50 million, with about 20% going to environmental control. BASF is looking to expand U.S. operations, currently searching for a home for a new R&D center on the East Coast.

PRODUCT OUTLOOK. On the product front, Mobay is expanding its Ponolith Supra pigment line and introducing dyes to fill specific needs (i.e., customized products for certain grades, furnishes, and production types). Sandoz Chemical plans new products as well. The company is currently experimenting with a new manufacturing technique for textile dyestuffs. Crompton & Knowles is reintroducing its Intrabond line with a review of 15 products in a new brochure.

—Michael Ducey

TABLE 1: **Production and price of dyestuffs.**

	1976	1981	1986	1989
Production (millions of lbs)	256	230	236	235
Average price ($/lb)	2.45	3.50	2.80	3.03

Source: U.S. International Trade Commission; *Chemical & Engineering News.*

ISSUE FOCUS: **OUTLOOK '89**

U.S. PAPER INDUSTRY WILL BE NEAR PEAK PERFORMANCE LEVEL THIS YEAR

High current operating rates and weak U.S. dollar are sources of strength as post-Reagan era begins; record capital spending planned

The U.S. paper industry achieved record production and earnings in 1988, and further gains are expected in 1989 despite a potential slowdown in overall economic expansion. Paper company executives and financial analysts responding to *Pulp & Paper's* annual survey acknowledge their concerns about the U.S. budget and trade deficits, rising interest rates, and international competitiveness, but the fundamental strengths of the paper industry are expected to more than offset these concerns in 1989.

As a result, paper industry management will step up capital spending programs to a record $11.5 billion in 1989, supported by continued strong earnings and cash flow. A similar capital spending boom is under way in Canada, where pulp and paper companies are planning to spend near the record C$3.8 billion expended in 1988. Capital spending is focused on cost reduction, improved quality and machine flexibility, and low-cost incremental capacity additions, rather than greenfield capacity additions. In Canada, several new greenfield projects are scheduled for Alberta and British Columbia based on large foreign investments in the domestic pulp and paper industry.

North American capacity growth of 3% in 1989 will be distributed across all grades but concentrated in pulp, newsprint, printing/writing paper, and linerboard. Capacity increases do not appear to be excessive yet, except for newsprint. A looming oversupply of newsprint has already given U.S. newspaper publishers the clout to postpone newsprint price increases originally scheduled for the first of the year. Most other grades were capacity constrained in 1988, so incremental additions coming online this year should not tip the balance to oversupply and prices should remain stable.

However, some grade segments, such as linerboard, showed signs that supply may be catching up with de-

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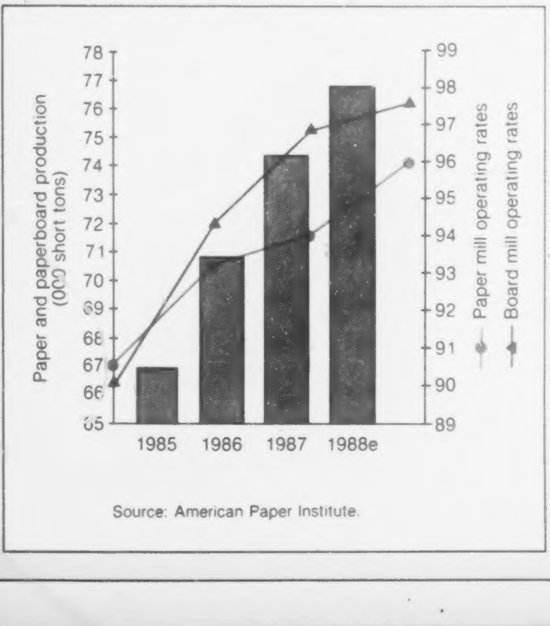
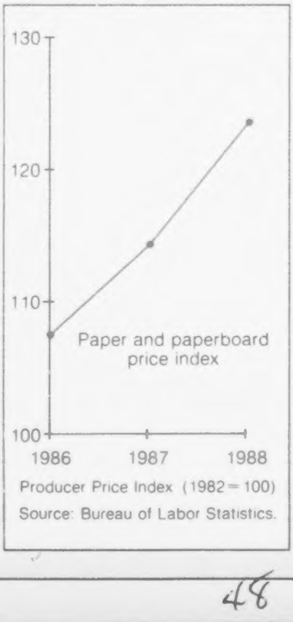
Outlook '89 was prepared by Pulp & Paper news staffers Noel DeKing in New York and Regina McGrath, Debra Garcia, Rob Galin, and Will Mies in San Francisco.

Strong demand caused U.S. mills to reach record production levels...



Source: American Paper Institute.

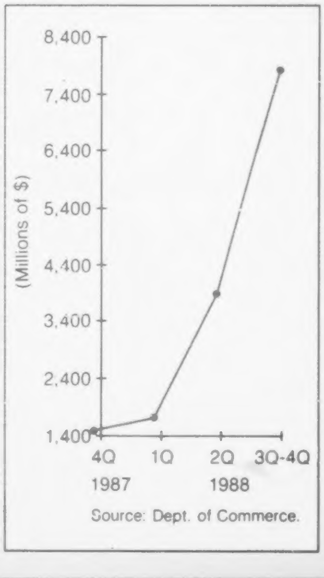
...causing prices to rise...



Producer Price Index (1982 = 100)

Source: Bureau of Labor Statistics.

...and lifting profits.



Source: Dept. of Commerce.

mand. And some analysts worry that if market conditions remain strong in 1989, companies may begin to tip the scale toward overexpansion in more grades besides newsprint. In market pulp, for example, there is a list of major projects scheduled for startup in the early 1990s.

MILD RECESSION. However, most industry watchers are preparing for the effects of a mild recession beginning in second-half 1989. "The key questions in a recessionary period are, What will happen to operating rates? and What will happen to prices?," said John Fery, Boise Cascade Corp president and CEO. Fery believes that operating rates for most grades will remain at 92% or above, a level at which pricing generally tends to remain stable. On the whole, the consensus *P&P* forecast calls for operating rates to average 94.8% for paper grades and 96.1% for paperboard grades in 1989, compared with 95.8% and 97.2% for paper and paperboard, respectively, in 1988. The tightest grades are likely to be market pulp, linerboard, and bleached board, while the weakest grades are likely to be tissue and coated printing paper.

In 1989, paper industry output is forecast to increase 2.3%, about equal to the 2.4% rate of growth of GNP. This is a notable slowdown from 1988's 3.5% gain in industry output and the general economy's 3.8% growth. Nonetheless, these gains should be sufficient to carry industry earnings higher in 1989, supported by higher prices for most grades. "Pricing for our major products continues to improve, which is characteristic of an operating climate where demand is pushing the limits of supply. Given this scenario, we expect to establish new records for sales and earnings in 1989," said Roger Stone, president and CEO of Stone Container Corp. Overall, paper company profits are forecast to advance by 11% in 1989 after rising nearly 60% in 1988.

Most analysts believe that 1989 will mark the peak of the paper industry earnings cycle, and they have turned their attention to what the bottom of the cycle might look like. "The long-term profitability of the industry will be enhanced by the benefits of several years of capital spending focused on cost reduction and U.S. producers' enhanced competitive position in world markets," said Mark Diverio of Shearson Lehman Hutton. "These underlying improvements will become evident in the next downturn, when the earnings decline may be only half of past cyclical declines," he added.

PRICE TRENDS. Paper and paperboard prices are expected to increase in early 1989, due mostly to the carryover effect from price increases that were implemented in second-half 1988. "By Apr. 1, we expect price increases to be implemented for market pulp, coated groundwood and uncoated free-sheet paper, some spe-

TABLE 1: **Analysts' projections for 1989.**

Percentage change from 1988 levels
(unless otherwise indicated)

	Growth in real GNP	Paper/board production	Operating rates[1]		Prices	Costs per unit output[2]	Earnings		Housing starts[4]
			Paper	Paperboard			Paper	Forest products[3]	
George Adler Smith Barney	3.1	2.4	94.9	96.6	5.0	3.0	15.0	9.0	1.37
Evadna Lynn Merrill Lynch	2.2	2.1	96.2	96.2	5.0	3.0	4.6	8.3	1.34
Mark Kurland Mabon Nugent	2.1	2.0	95.0	96.0	0	2.0	10.0	5.0	1.30
Lawrence Ross Paine Webber	2.5	1.0–2.0	94.0	96.0	6.0	3.0–4.0	15–20	12–15	1.40
Thomas Farrell Deutsche Bank	2.5–3.0	3.0	96.0	97.0	4.0–6.0	1.0–2.0	20	10	1.20
William Wigder First Boston	2.5	2.5	95.0	96.0	3.0–5.0	2.0	15.0	0	1.40
Chad Brown Drexel Burnham Lambert	2.8	3.5	93.5	95.0	5.0	4.5	15.0	10.0	1.32
James Wei Tucker Anthony	0	2.0	94.0	97.0	3.0	5.0	(12.0)	(4.0)	1.25
Tom Clephane **Jeanne Carroll** Morgan Stanley	3.0	2.2	95.1	95.4	6.4	4.5	15.0	(25)	1.35
Mark Diverio Shearson Lehman Hutton	2.6	2.0	94.7	96.1	3.5	3.0	12.0	17	1.38
Average	**2.4**	**2.3**	**94.8**	**96.1**	**4.3**	**3.2**	**11.2**	**4.4**	**1.33**

1. Production as percent of capacity. 2. Weighted for full year. 3. Estimates may include. 4. Millions of units.

cialty paper, bleached paperboard, and clay-coated recycled board. These are likely to be the only price increases that are fully implemented this year," stated Merrill Lynch analyst Evadna Lynn. Exceptions to these general price increases at the beginning of 1989 would include linerboard, tissue, newsprint, and coated papers, for which pricing problems are anticipated. Customer resistance to higher market pulp prices is also foreseen. This should result in an average industry price increase of 4% to 6% in 1989, which compares with an average price increase of 12% in 1988.

If a weakening economy leads to price discounting in the second half of the year, the impact on earnings may not be as severe as in previous downturns because the customer inventories are low and the industry is more concentrated. "For many grades of paper there are now fewer producers. A more oligopolistic structure could mean less price cutting in the next downturn," said Chad Brown of Drexel Burnham Lambert.

On the cost side, inflation in unit costs is likely to be higher in 1989 but will still be lower than the assumed rise in average prices. Wood costs are likely to rise sharply because of the reduction in chip supply as lumber production declines, particularly in the Pacific Northwest. Labor cost inflation will continue at a moderate pace, while chemicals will increase at a slower pace than in 1988. Depressed oil prices will keep energy costs down this year. Industry costs are forecast to rise an average 3.2% in 1989.

Interest rates are headed upward as the Federal Reserve Board has repeatedly

TABLE 2: **Industry operating rates.**

	Operating rates (%)				
Paper	**1984**	**1985**	**1986**	**1987**	**1988e**
Newsprint	94.7%	93.8%	97.0%	98.3%	99.3%
Uncoated groundwood	91.8	89.0	91.4	84.6	86.7
Coated paper	95.3	88.2	92.9	93.1	96.9
Uncoated freesheet	91.0	92.2	94.4	95.3	96.6
Bristols	91.9	87.8	96.6	98.0	98.0
Thin paper	89.6	80.4	79.2	81.2	71.5
Cotton paper	81.2	77.0	79.2	82.6	82.2
Kraft and industrial	91.8	87.0	88.9	90.7	92.0
Tissue	93.3	92.4	93.1	94.1	95.1
Total paper percent	**92.8%**	**90.5%**	**93.2%**	**94.0%**	**95.8%**
Paperboard					
Kraft Linerboard	96.8%	90.7%	95.5%	99.9%	100.1%
Other kraft	90.4	84.3	88.9	87.2	83.4
Total	**96.4%**	**90.2%**	**95.0%**	**98.9%**	**98.8%**
Semichemical	98.4	94.0	96.7	96.7	99.3
Bleached board	96.7	90.3	93.3	94.5	96.6
Recycled	87.6	86.8	89.7	91.9	93.9
Total paperboard percent	**94.6%**	**90.0%**	**93.8%**	**96.8%**	**97.2%**
Total paper and paperboard percent	**93.7%**	**90.2%**	**93.5%**	**95.4%**	**96.5%**

e=Estimates.
Source: American Paper Institute.

TABLE 3: **Industry production.**

	Production (000 tons)				
Paper	**1984**	**1985**	**1986**	**1987**	**1988e**
Newsprint	5,539	5,428	5,630	5,842	5,971
Uncoated groundwood	1,565	1,521	1,540	1,485	1,617
Coated paper	6,249	5,875	6,263	6,860	7,410
Uncoated freesheet	9,152	9,690	10,410	10,977	11,379
Bristols	966	930	990	1,044	1,130
Thin paper	303	262	247	251	221
Cotton paper	147	144	152	163	162
Kraft and industrial	5,586	5,204	5,117	5,072	5,207
Tissue	4,921	4,941	5,095	5,301	5,488
Total paper	**34,428**	**33,995**	**35,444**	**36,994**	**38,585**
Percent change	**5.0%**	**1.3%**	**4.3%**	**4.4%**	**4.5%**
Paperboard					
Kraft Linerboard	16,038	15,183	16,402	17,682	18,084
Other kraft	1,147	1,185	1,287	1,232	1,272
Total	**17,185**	**16,368**	**17,689**	**18,913**	**19,356**
Semichemical	5,169	5,088	5,376	5,600	5,707
Bleached board	4,048	3,948	4,271	4,420	4,508
Recycled	7,637	7,630	8,083	8,506	8,873
Total paperboard	**34,039**	**33,034**	**35,419**	**37,439**	**38,427**
Percent change	**5.8%**	**2.9%**	**7.2%**	**5.7%**	**2.6%**
Total paper and paperboard	**68,467**	**67,029**	**70,863**	**74,433**	**77,012**
Percent change	**5.8%**	**2.9%**	**7.2%**	**5.7%**	**2.6%**

e=Estimates.
Source: American Paper Institute.

raised the prime rate to slow inflation. Most analysts expect a further 1% to 2% increase in interest rates before they decline. One scenario calls for the 30-year Treasury bond rate to reach a peak of 9.3% in the first quarter. The Fed adheres to the theory that inflation is primarily the result of excessive growth in the money supply. Some members of the Fed's policy-setting committee have warned that they will push up interest rates if the U.S. economy grows faster than about 2.5%. The National Assn. of Business Economists forecasts that the economy will grow at about the 2.5% level and inflation will creep up to a 5% annual rate in 1989, compared with 4.1% in 1988.

Higher interest rates will push housing starts down to 1.3 million units in 1989, leading to lower operating rates and deteriorating prices and earnings for lumber and wood products operations. The wood products business began a cyclical decline last year after peaking in 1987, and further declines are forecast this year. Lumber and plywood prices are currently weak and close to the break-even level for sawmills in the Pacific Northwest and British Columbia. The industry currently has excess capacity, so some mill shutdowns are anticipated. Lumber exports should remain strong, but volumes are insufficient to offset weakness in the huge U.S. market.

WEAK DOLLAR. The weak dollar has given U.S. producers a manufacturing cost advantage when selling pulp, linerboard, and other products in overseas markets. A further 2% to 3% decline in the dollar is expected in 1989, and this could lead to higher export volumes. In 1988, pulp exports jumped 12.3%; paper grades, mostly newsprint, rose 18%; and paperboard grades, mostly linerboard, increased just 3.4%. The modest gain for the paperboard grades resulted because production of these grades was strained to meet domestic demand, although a drop-off in orders from China hurt linerboard exports in second-half 1988. In fact, exports of bleached milk carton board, one of the industry's most attractive opportunities, were actually down last year because producers diverted production to meet domestic demand. Nonetheless, a number of producers are increasing their marketing efforts, developing joint ventures, or increasing production capacity to become long-term players in world markets. "It seems that export participation will be one of those things that is company specific rather than industry wide," commented Lawrence Ross of Paine Webber.

On the import side, shipments of newsprint were flat but printing/writing grades, mostly uncoated groundwood, jumped 17.5% in 1988. The U.S. continues to attract imports in the printing/writing grades because the domestic industry is running at capacity, demand is high, backlogs are building, and the customer base is reaching offshore for additional supplies. Most of these imports are supplied by Canada, which accounts for 75% to 80% of foreign shipments to the U.S. The reduction of U.S. tariffs on Canadian imports, which is scheduled to begin this year, could lead to even higher volumes from Canada.

INDUSTRY STRUCTURE. Although the major share of industry restructuring and consolidation has already occurred, the trend will continue, albeit at a slower pace. Paper companies have begun to attract greater interest among foreign investors, noted Shearson's Diverio. Besides Japanese firms that have acquired stakes in U.S. and Canadian paper and forest products companies, investment capital has also flowed in from the U.K., Australia, New Zealand, France, Finland, and Kuwait. In addition, takeover speculation surrounded Mead Corp., Bowater Inc., and Kimberly-Clark Corp. last year. In a related development, the management of Fort Howard Corp. took the company private in a leveraged buyout transaction.

Further restructuring will likely occur in light of the industry's favorable prospects, cheap stock valuations relative to inherent earning power, and a surplus of foreign capital and excess cash flow that are available for acquisitions.

UNCOATED FREE-SHEET

NEW CAPACITY MAY CAUSE SOFTENING

■ Rising demand for office and business papers is expected to continue to push up demand for uncoated free-sheet grades and encourage higher production levels at U.S. and Canadian paper mills. This strong demand will help keep mill operating rates in 1989 above the 97.0% estimated for 1988.

Strong consumption rates will be seen in major end uses (such as office bond, forms bond, reprographic, tablet, and envelope), printing papers (offset, cover, and text), and miscellaneous (such as technical, papeterie, or colored school).

But capacity also is going to rise substantially, and mills seem to be announcing new, "world class" machines of 250,000 to 300,000 tpy on a regular basis. Among these are Union Camp Corp., Georgia-Pacific Corp., and Boise Cascade Corp. Additional machines may be installed by Great Northern Nekoosa Corp., Bowater Inc., and Weyerhaeuser Paper Co. Still, all this potential new capacity is expected to be in relative balance with demand.

North American mills are continuing to expand with ever-larger paper machines. A number of mills have announced new installations for units that can produce 300,000 short tpy or more. These include Georgia-Pacific, Boise Cascade, and possibly Great Northern Nekoosa at Ashdown, Ark. Slightly smaller machines are on tap for Union Camp, Willamette Industries Inc., and possibly Weyerhaeuser and Bowater.

Startup of new, larger machines has gone quite well in most cases. The 290,000-tpy uncoated machine at Georgia-Pacific's Port Hudson, La., mill was reportedly running at 65% of rated capacity less than two months after startup. Weyerhaeuser Canada Ltd.'s 210,000-tpy alkaline communications papers machine at Prince Albert, Sask., reportedly has also been running quite well.

Canadian printing and writing paper capacity is expected to rise 16.5% in 1989 from 1988, according to the recently released Canadian Pulp & Paper Assn. capacity survey. Roughly 30% of total printing/writing capacity, not including uncoated groundwood papers, is coated; the rest is uncoated free-sheet grades.

Canadian printing/writing capacity will reach about 1.773 million metric tons in 1989, according to the CPPA report. Another 15.9% increase to 2.055 million metric tons will occur in 1990, CPPA said.

HIGH OPERATING RATES. Operating rates at uncoated free-sheet mills are expected to remain between 93% and 96% or higher in 1989. Many analysts are predicting two- or three-percentage-point declines in second-half 1989, primarily due to an expected economic downturn that some even call a recession. Production could reach nearly 12 million tons this year, according to Merrill Lynch analyst Evadna Lynn. The uncoated business papers segment may run at better than 97%, if Morgan Stanley analysts are correct.

On a slightly more pessimistic side, First Boston's William Wigder puts 1989 production at more than 13 million tons, with operating rates a low 92.9%. Roger Ashby of Domtar Inc. told an industry gathering that North American growth for uncoated white papers may be just 2.0% to 2.5% this year.

Demand will remain relatively strong through the first half of next year. However, inventory building in response to announcements of price increases may slow some orders. After jumping roughly 40% in 1988, imports into the U.S. may show further growth this year, even with the decline in the dollar, according to some observers.

All grades of uncoated free-sheet paper underwent price increases in 1987 and 1988. The increases brought the commodity grades, such as forms bond and offset, to levels at or above their highs of 1984. The market was experiencing slight softening, but most buyers and sellers expected the latest increases to hold and paper to sell near list prices. A few mills producing reprographic and other cut-size bond grades have announced $40/ton price increases for January.

Forms bond producers raised their list prices by $50/ton for shipments on Oct. 1 or Oct. 3. The increase put 15-lb forms bond at about $910/ton. Related paper grades rose, including one-time carbonizing (OTC) tissue, which increased about 5% to 6% on Oct. 17. Forms bond, which sold for $753/ton list in 1981, dropped in 1985 to $600/ton but then began a steady rise again.

EXPANDING MARKETS. The best markets for uncoated free-sheet grades are bond, mimeo, duplicating, and reprographic, which account for 24%; forms, 21%; offset printing, 25%; envelope, 11%; tablet, 4%; carbonless, 6%; and other, 9%.

Slightly more than 2.7 million tons of uncoated offset paper were produced in the U.S. in 1987. Shipments to book publishers were 560,000 tons, or 60% of the 930,000 tons of paper shipped to book publishers. In contrast, uncoated groundwood represented 7.5%, and the coated grades accounted for 32%.

Consumption of uncoated free-sheet paper for books rose 25.2% from 1982 to 1986, compared with the 24.9% gain made by coated papers and the 15.8% loss by uncoated groundwood grades. However, uncoated free-sheet experienced a small 1.7% decline from 1986 to 1987, while coated gained 1% and uncoated groundwood almost 2.5%.

Shipments of offset and other uncoated free-sheet paper to commercial printers gained more than 8% in 1987 from 1986. This compares with coated, which gained more than 15%, and uncoated groundwood, which lost 14%.

Demand for cover and text grades has grown by about 4.1%/year since 1980, reaching somewhere near 300,000 tons in 1987. Text papers represented about 65% of this market, at over 190,000 tons, in 1987.

In the bond, mimeo, duplicating, and copy grades, the paper shortage last year caused some mills to produce the higher-value reprographic and cut-size grades at the expense of forms bond, adding to a forms shortage.

Use of computer printers is expected to continue to grow as a major market for cut-size bond and copy papers, though forms bond growth may slow. Richard Norton, director of Imaging Supplies Industry Services and Copying & Duplicating Industry Services for Dataquest Inc., forecasts overall demand growth for cut-size papers used for computer printers and copy machines at 20.6%, from 393,000 tons in 1986 to 1 million tons in 1991. Most of this paper is uncoated free-sheet.

Page (laser) printers accounted for about 288,000 tons of cut-size paper in the U.S. in 1986, and this number will rise to 786,000 tons by 1991. Copier paper will post 4.0%/year growth between now and 1991, Norton said. That is slightly under 2.0 million tons in 1986 to almost 2.4 million tons in 1991.

Use of stock continuous forms will grow at 7%/year, from 1.7 million tons in 1986 to 2.4 million tons in 1991, according to Norton. Its sister paper, custom continuous forms, will show practically zero growth over these five years.

Of all paper shipments in 1987 to U.S. business forms converters, uncoated free-sheet bond represented 92%, or 2.8 million tons. In comparison, uncoated groundwood, at 228,000 tons, made up the balance, except for coated bond (0.2%). The groundwood segment began to decline at the beginning of the 1980s, falling about 4.5%

between 1982 and 1986, and dropped another 6% in 1987. At the same time, uncoated free-sheet for forms rose almost 44%, gaining an additional 3% in 1987.

Also used in multipart continuous forms is carbonless paper. Basestock for carbonless coating represents a market of almost 600,000 tpy, having grown almost 45.4% from 1982 through 1986 and over 10% from 1986 to 1987. In contrast, OTC production was just under 110,000 tons in 1987, down more than 7% from 1986. Carbonizing tissue can be groundwood paper. A major converter expects carbonless papers to move from 45% of the multipart forms market to 60% in several years.

COATED PAPERS

DEMAND WILL ABSORB NEW CAPACITY

■ Paper industry analysts expect coated paper markets to remain relatively strong in 1989, enough so that demand will absorb new capacity. These advances will be based on increased demand from such end-use markets as magazines, advertising inserts and flyers, catalogs, and other commercial printing.

This means that operating rates at coated mills probably will average about 95.5%, slightly higher than 1988's estimated average utilization of 95.3%. Most analysts see these figures getting even better in succeeding years.

Overall consumption of coated paper grades may rise by 4.0% over 1988, a year that saw an exceptional 8.1% estimated growth in consumption of all paper grades, according to Goldman Sachs analysts Bruce Kirk and John Chrysikopoulos. Consumption growth in 1990 may advance another 4.8%. These healthy markets have allowed producers to raise prices beyond the high levels set in 1984-85.

Merrill Lynch analyst Evadna Lynn forecasts apparent U.S. consumption of coated groundwood papers to rise from an estimated 4.7 million tons in 1988 to almost 4.8 million tons this year, with a 3% increase in 1990. This will bring down the operating rate from 99.4% last year to 98.6% in 1989 and 97.4% in 1990, Lynn said. First Boston analyst William Wigder forecasts 6.0% average annual growth in coated free-sheet production and 6.1% growth in capacity.

Producers of coated groundwood papers continue to benefit from an improving magazine market and a very healthy commercial printing sector. Magazines reported selling 3.1% more advertising pages in 1987 than in 1986, the Publishers Information Bureau said.

For coated free-sheet grades, Lynn expects consumption to increase 3.1% from last year to just over 3.5 million tons in 1989. By the end of 1990, consumption may hit almost 3.8 million tons. Operating rates for coated free-sheet mills will decline from 96.4% in 1988 to 94.4% this year but will jump back to 96.8% in 1990. Overall coated paper demand probably will continue to grow somewhat above the real GNP in the next few years.

Magazine publishers did better than expected in 1988. A possible economic downturn and higher advertising rates could hurt paper sales to these publishers, but most analysts still expect some moderate growth in this sector. In fact, Mead Corp.'s Robert C. Eisenach said at a recent conference that the company expects magazine growth of 2.5% on average over the five years through 1992. Magazines will use 51% of the coated groundwood and 18% of the coated free-sheet paper produced.

CATALOGS STILL GROWING. The catalog business also has been growing rapidly. Demand for catalogs is increasing dramatically, according to the Direct Marketing Assn. Simmons Market Research said that 51.2% of the U.S. population (87.7 million Americans) shops by mail, a 15% increase from 1985. Actual catalog production rose 18% in 1986, representing 11.8 billion pieces from about 6,500 publishers. Demand for coated papers for catalogs could reach over two million tons by 1990.

Mead forecasts catalog growth of 7.0% through 1992, of which 23% is coated groundwood and 31% coated free-sheet.

Another major market is commercial printing, which uses about 53% of all coated paper production, according to Eisenach. Some 2.9 million tons of coated paper went into that sector in 1987.

Included in that market are direct mail flyers and newspaper advertising inserts. Preprinted newspaper inserts are growing at an estimated 5% to 7%/year, with coated paper usage for inserts to rise from about 400,000 tons in 1986 to 600,000 in each of the four following years. The rest of the approximately 2 million tons of insert paper is newsprint or uncoated groundwood grades.

About 300,000 tpy of coated paper went into the book market in each year from 1984 through 1987. Demand may grow as much as 5%/year in the next one or two years. Eisenach said books should advance by about 2.0%. Just 9% of coated production is used by book printers and publishers.

Demand for coated papers in the 1990s is expected to be healthy, jumping to somewhere near 10 million tons in the U.S. alone. Canadian demand will reach several million tons. This means that imports into the U.S. also will rise, with Scandinavia, Fed. Rep. Germany, and Canada being the major suppliers. Canada will also see imports from Europe, Scandinavia, and the U.S.

The coated paper industry has recognized that one threat to coated paper is supercalendered (SC) paper. Premium SC papers usually are offered for sale at $100/ton less than lightweight coated. Other threats come from high-brightness uncoated groundwoods and the new Scandinavian lightly pigmented grades that fall between SC and coated groundwood.

TISSUE

WILL PRICE HIKES STICK?

■ Last year, producers of consumer tissue implemented their first increase on roll tissue products in about seven years. In April, James River Corp. led the price increase attempt by announcing increases of 9.2% on toilet paper, 5.6% on towels, 5.0% on napkins, and 7.5% on facial tissue. Scott Paper Co. and Procter & Gamble Co. followed.

Producers did not intend the increase to truly take effect until June, but they ended up waiting until September-October to implement the hike. The long lag time is indicative of how competitive the consumer tissue market is: producers delayed implementation by offering special deals and discounts to maintain market share, and they did not get the full amount of the increases.

In November, Scott Paper Co. announced it was raising its prices for all its towel grades and its paper napkins by 5% to 8%, with the average increase being close to 7%. The hike was to be phased in over a three-month period.

Scott's announcement came when producers had just implemented the hike led by James River. This highlights the extreme margin pressure consumer tissue producers have been subject to in the form of rising pulp and secondary fiber prices. Consumers will no longer accept fewer sheets on the roll, and price increases are the only way for producers to pass on these costs. With Scott's sale of its stake in Brunswick Pulp & Paper Co., all of the U.S consumer tissue producers are net buyers of pulp. The problem is that consumer tissue producers are tempted to offer discounts that erode their margins to maintain market share, so announced price hikes can become meaningless.

Early this year, the tissue market will be trying to absorb the 70,000 tpy of new capacity that came onstream in late 1988 at James River's Clatskanie, Ore., mill. Several new machines are slated for startup in the second half of this year (Table 6), but the additional capacity shouldn't have much of a downward effect on prices until the fourth quarter.

What will endanger the price increases in both the consumer and the commercial and industrial (C&I) market is a slowdown in the economy. Although consumers continue to buy tissue products in a recession, they may trade down to lower-quality products or to private-label products. C&I producers have more to lose in a recession since demand for their products is more closely linked to industrial production.

C&I MARKET. Producers of C&I tissue—Fort Howard Corp., James River, Scott, and Georgia-Pacific Corp. —implemented two price increases in 1988: a 5% increase in the spring and a 6.9% increase in the fall. Industrial tissue merchants feel the market cannot bear another increase in spring 1989, but producers could try for another hike during the first half since tissue capacity will be fairly tight then. Producers generally get about half of the announced price hikes, so they have raised prices about 12% during 1987-88.

Besides jockeying for market share in Europe, James River and Scott Paper are investing in their pulp and fiber supply. James River plans to raise its U.S. pulp capacity by 350,000 tpy through incremental capacity expansions at existing mills, and it is also expanding deinking capacity at one mill. It also has an indirect equity interest in Aracruz Celulose SA of Brazil, which is doubling its eucalyptus kraft pulp capacity.

Last year, Scott bought 20% of the Papeles Sud America mill in Nacimiento, Chile. About $200 million is being invested in the mill to convert it to making eucalyptus pulp. Startup is slated for 1990, and Scott Worldwide will be a major customer. Toward the end of last year, Scott announced it will spend over $50 million to expand tissue capacity in the Malaysia, Thailand, and Taiwan. Scott is the leading tissue producer in these markets.

CONTAINERBOARD

SUPPLY CATCHING UP WITH DEMAND

■ Containerboard producers enjoyed another healthy year in 1988, even though the linerboard market showed some signs of easing in the fourth quarter. Nevertheless, corrugated box shipments for the year were up approximately 3%, linerboard mills operated at around 97% of capacity, and industry profits surged again to record-high levels.

The loosening in the market last fall reflected slower growth in U.S. box shipments combined with lower-than-expected linerboard export shipments. After increasing 3.8% in first-half 1988, corrugated box shipments in the third quarter grew only 1.5% from a year ago. Meanwhile, linerboard export shipments for the year were expected to be relatively flat at around 2.3 million short tons.

The main reason for the poorer-than-expected performance for linerboard exports was a drop-off of about 40% in shipments to People's Rep. China, which purchased heavily in 1987. Excluding mainland China, U.S. exports would have been up about 6% last year, Thomas P. Clephane of Morgan Stanley noted in a recent speech given to *Pulp & Paper*'s Third International Unbleached Kraft Conference in Atlanta, Ga.

Another factor that probably caused the market to soften was faster-than-expected capacity growth caused by a large number of incremental expansion projects. These projects typically involve wet end rebuilds, addition of high-pressure presses, and additional fiber (either from debottlenecking the existing kraft mill or adding a secondary fiber line).

A total of more than a dozen major rebuilds will be completed during 1988-89, Nickey J. Rudd, vice president of BE&K Engineering Co., told the same conference. As a result of such projects and operating improvements, U.S. linerboard capacity may be expanding at a 4%/year pace over the 1988-91 period, Victor Casebolt, senior vice president of International Paper Co., told customers last year. As a result of these trends, indications in second-half 1988 suggested that industry linerboard supply had caught up with—and had slightly exceeded—demand.

One indication was rising containerboard inventories at box plants and mills, which hit a high of 2.724 million tons at the end of September (equal to 6.2 weeks of supply). Another indication was growing discounting by U.S. mills—particularly some weaker producers—in export markets in the fourth quarter. According to some estimates, linerboard export prices by the end of the year were about $20 to $30 below the domestic U.S. list price of $410/short ton.

TIME FOR A PRICE INCREASE? By late last year, the soft market conditions were causing considerable uncertainty as to whether producers would be able to push through a $40/ton linerboard price increase in first-quarter 1989. By mid-December, only about four producers had joined the increase, which would take the domestic list price of linerboard to $450/ton in January.

However, there were still some indications that producers might be successful in raising prices sometime in the first quarter. The economy and corrugated box shipments remained fairly strong in fourth-quarter 1989 (with October box shipments up 4%), and this was expected to carry over into early 1990. Inventories of containerboard at box plants and mills by Nov. 1 had dropped back down to 2.532 million tons, or 5.3 weeks of supply (the lowest level all year in weeks).

The drop partly reflected accelerated maintenance downtime and rebuilds at U.S. mills in November and December, which eliminated more than 150,000 tons of potential production, according to some estimates. Not surprisingly, analysts are mixed on the containerboard industry's outlook for 1989. Clephane expects corrugated box shipments to grow by 2.7% this year, based on a 3% growth in real GNP and a 3.7% rise in industrial production. In 1990, he expects zero economic growth due to a moderate recession, which would result in flat box shipments. Export linerboard shipments are expected to increase by about 4%/year in 1989 and 1990.

Linerboard mill operating rates are expected to average 94.7% in 1989 and 92.8% in 1990—"well above the 93% to 94% range that normally defines a seller's market." As a result, Clephane believes producers will be able to push through a $30/ton increase in prices effective Mar. 1, which will help the linerboard industry achieve a 16% increase in average operating income in 1989.

BOXBOARD

FLAT GROWTH TREND EXPECTED

■ Boxboard producers should enjoy steady markets for bleached, recycled, and unbleached kraft paperboard in 1989, led by exports and folding cartons. Capacity additions will be limited to machine rebuilds, so even a slight decline in demand for the packaging grades will not lower operating rates significantly.

Production of bleached board was up only 2% in 1988 after advancing 12% in 1986-87. The supply of bleached board was limited in the first half of the year due to a series of scheduled downtimes at solid bleached sulfate (SBS) mills, leading some mills to initiate customer allocation. As much as 100,000 tons of production capacity was lost in 1988, according to several industry executives. Most of the supply shortfall was in the milk carton grades, which sharply curtailed exports. SBS folding carton markets were also tight most of the year, but production rebounded in the second half as more supply became available.

Recycled paperboard production increased about 4% in 1988, led by strong folding carton and industrial packaging markets. Recycled mills producing clay-coated folding carton stock reported strong orders throughout the year due to the shortage of SBS board and the increasing price differential with SBS. During the third quarter, 15-pt SBS was selling for about $675/ton, while 20-pt clay-coated newsprint (CCN) was selling for $445 to $465/ton. Markets for gypsum linerboard, corrugating medium, and tube and can stock were also strong as the country's industrial output and construction activity escalated.

Unbleached kraft boxboard production increased approximately 5% in 1988. Most of the coated kraft board produced by Mead Corp. and Manville Corp. is used in the beverage carrier market, where the increased use of multi-packs and exports has spurred growth. At the same time, both producers have expanded their folding carton business, where coated kraft board competes with SBS and CCN. Prices of coated kraft board fall between these two grades, and 20-pt folding carton board was selling for about $520/ton in the third quarter.

STRONG PRICE ADVANCES. In 1988, bleached board producers increased prices by $40/ton in April and $55/ton in September, raising the price of 15-pt SBS in rolls to $730/ton at year's end. Because the SBS market was tight throughout the year, producers had considerable leverage in implementing these price hikes. For 1989, producers will attempt a $50/ton price increase in early January when market conditions are still expected to be favorable. If the January increase is successful, it may represent a peak in SBS prices if markets weaken later this year.

The sharp upswing in SBS prices has been spurred by surging pulp prices. Historically, market pulp prices and SBS prices move in sequence since SBS is a type of value-added bleached pulp. Producers of both bleached pulp and SBS try to maintain a premium price for the board, but in 1988 pulp prices were approximately even with SBS prices. This price trend led to increased production of market pulp on swing machines in 1988, thus further reducing available SBS capacity.

Recycled boxboard producers were equally aggressive in 1988 and increased prices of folding carton board three times during the year. As a result, prices for 20-pt CCN increased from about $400/ton at the beginning of the year to approximately $500/ton at year's end. Prices vary $10 to $15/ton for producers in the East and Midwest based on different wastepaper costs, and they also vary by the basis weight and quality of the multi-ply boards manufactured by various producers.

Most producers of recycled chipboard and setup boxboard also raised prices in 1988. These industrial grades are used in the manufacture of rigid boxes, composite cans, tubes and cores, and various diecut products. Prices range from a low of about $250/ton up to $450/ton for specialty grades.

OUTLOOK IS STEADY. Demand for boxboard grades is expected to remain steady in the consumer packaging markets in 1989, but some weakness may occur in the industrial packaging grades. Total SBS production should remain at the 4.5-million-tpy level, with folding carton, milk carton, and other packaging grades remaining near their 1988 levels. Recycled and unbleached kraft folding carton production is expected to gain slightly as these grades find greater acceptance in the marketplace. Recycled folding production should increase about 2% to 2.5 million tpy, and kraft board production for both cartons and carriers will increase about 3.5% to 1.1 million tpy. Operating rates for all grades should run at 94% or above in 1989 since capacity additions will largely be limited to productivity improvements rather than capital expansions.

Most of the planned capacity expansions for the boxboard grades will come online after 1989.

WASTEPAPER

PRICES FALLING OFF

■ Most of 1988 was a sellers' market for wastepaper. Mills found themselves paying historically high prices for pulp substitutes as these prices kept pace with increases in market pulp. High operating rates in all paper grades bolstered demand for the lower grades of paperstock. In contrast, 1989 doesn't hold promise of being another record year. The wastepaper market is a good litmus test for the health of the industry, and the first hints of a recession will be felt here first.

The anticipated first-quarter increase on hardwood and softwood market pulp should bring a modest increase in the price of hard white envelope cuttings and hard white shavings. Most observers don't expect these prices to continue the upward spiral they were on for most of 1988, however. Deinking stocks were in high demand in 1988 as more mills traded down to these grades and installed additional secondary fiber lines to shield themselves from high pulp substitute prices. Startup of FSC Paper Co.'s 80,000-tpy recycled tissue machine later this year and of a similar-size machine at Fort Howard Corp.'s Rincon, Ga., mill will help keep demand for these grades strong.

Increased use of laser printers is generating a growing supply of laser-printed computer printout (CPO) paper. Kimberly-Clark Corp. continues to buy 100% laser-printed CPO to supply a new plant it built in Memphis, Tenn., that is using proprietary technology to remove the laser print from the paper. Plans reportedly call for K-C to also install the technology in an affiliate's plant in Rep. Korea. Although other mills are already using 100% laser-printed CPO, K-C's method is said to remove all traces of the ink so it can use the paperstock to make high-quality consumer tissue products.

The seasonal slowdown that occurred late last year in the brown grades—old corrugated containers (OCC), new double-lined kraft corrugated clippings, and bag waste—should be alleviated in the first half as generation of these grades falls. Last year, linerboard mills ran full out. Since little new capacity is coming onstream in 1989, these mills should continue to demand the lower grades, barring a major recession.

Supply of old newspapers (ONP) will continue to exceed demand as more states and municipalities enact mandatory source separation laws. New Jersey was the first state to require its residents to separate ONP from the rest of their trash. This led to a decline in the quality of ONP. If mills want to take advantage of the abundant supplies of ONP that mandatory collection programs generate, they will have to install better cleaning equipment. This would be a better investment in promoting recycling than buying more trash trucks or recycling bins. Substantial new newsprint capacity will come onstream in the next two years, providing some outlet for the ONP, but ONP prices will not recover. In fact, municipalities may have to pay brokers to take the ONP supplies away as landfill space becomes scarce.

Since paperstock is one of the biggest U.S. exports, the economies of Far Eastern countries (the biggest buyers) play a large role in domestic wastepaper supplies. Toward the end of last year, the yen became so expensive relative to the dollar that U.S. citizens were discouraged from buying a lot of goods from Japan. This reduced Japan's need for OCC, which it turns into boxes to ship goods back to the U.S. The exchange rates also led to a prolonged shortage of containers in the U.S. since most of them were sitting in the Far East.

CANADIAN INDUSTRY

GLOBAL-SCALE COMPETITION CAUSING MILLS TO FOCUS ON COSTS, CURRENCIES

Pulp and paper companies in Canada have come through a year of ups and downs that forced many more to realize and respond to a new competitive equation. The focus now is on a global marketplace—encompassing such factors as currency exchange rates, trade policies, and world pulpwood supplies. At the same time, the industry is working at home to cut costs, upgrade facilities, and improve quality and customer service.

Canadian forest products industry earnings were expected to rise about 20% in 1988 from the year before and could match that performance again in 1989, according to some industry prognosticators. Other observers, though, think the industry's earnings may have peaked in 1988 and will be flat this year. But as 1989 ends, most forecasters are less optimistic on the economy. Many are projecting a slowdown or a recession in first-half 1990.

Through 1989, many expect the industry will experience a gradual slowdown overall. Sectors such as newsprint and lumber may deteriorate more rapidly, while market pulp and coated papers will remain buoyant. Linerboard and uncoated groundwood markets are expected to remain relatively flat.

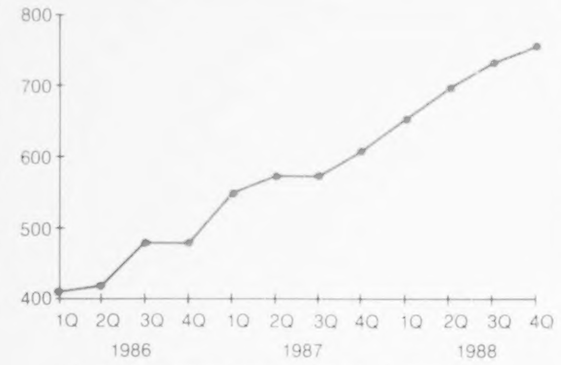
Newsprint markets will be eroded by a substantial rise in capacity beginning in the second half, while a sluggish construction market and higher costs are expected to pull down lumber margins. Market pulp and coated paper capacity will be relatively flat and demand generally good; however, even these markets are expected to begin to ease by early 1990.

The Canadian Pulp & Paper Assn. projected industry shipments would rise by about 3% in 1988 to 25 million metric tons and could reach 35 million tons—28 million tons exported—by 2000.

CURRENCY RATES TO STABILIZE. Canadian exports in 1989 should continue to benefit from stable Canadian currency exchange rates affecting overseas markets. The U.S. dollar should also level off in relation to the Deutschmark and yen, adding more impetus to Canadian commodities traded in the U.S. currency. Canadian mills will not see much relief from the effects of the exchange rate with the U.S., however.

In 1988, Canadian companies suffered from a rising dollar that reduced gains on sales made in the U.S. A newsprint price hike in first-quarter 1988 was practically obliterated simply due to the rising Canadian currency. "Unless the Canadian dollar reverses itself substantially, Canada's newsprint mills could thus find them-

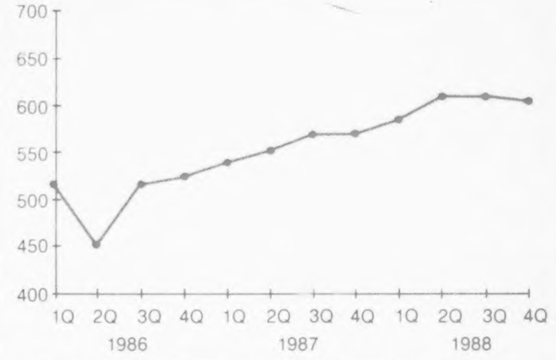
Market pulp prices are peaking....



Estimated transaction price in eastern U.S. ($/metric ton)

Source: P&P Week

...while newsprint prices are faltering.



Price for northern bleached kraft pulp delivered in U.S. ($/metric ton).

Source: P&P Week

selves rather hard-pressed by the competition during the weak period for newsprint we expect in 1989-91," noted Ross Hay-Roe in the August 1988 issue of *PaperTree Letter*.

Many analysts forecast the Canadian dollar will be worth US$0.80 to $0.82 in 1989. The Conference Board of Canada expects it to maintain this level through 1990. Jay Woodworth, vice president and chief domestic economist for Bankers Trust Co. of New York, projected a rise to US$0.90 by the end of 1989. In a quarterly survey conducted by the Conference Board of Canada, economists predicted that real gross domestic product would increase an average of 3.8% in 1988 and 2.1% in 1989, while inflation is expected to remain around 4.1% in 1988 and average 4.7% in 1989.

FREE TRADE AGREEMENT. If the pending free trade agreement with the U.S. is not ratified, inflation and interest rates would be higher than expected but the value of the Canadian dollar and growth would be lower, according to forecasters. Some expect a drop in the Canadian dollar to as low as US$0.75.

Canadian industry earnings would rise if the Canadian dollar dropped because of higher returns on sales in the U.S. However, this would subsequently lead to negative effects in stock market prices, foreign investment, and interest rates, some analysts indicated. But with the Canadian voters returning the Progressive Conservative Party to power in Canada last November, passage of the bill in early 1989 appeared inevitable.

Sorting out the pros and cons, the Canadian industry has come to generally support passage of the free trade agreement, which is expected to open up new markets by eliminating remaining pulp and paper industry tariffs over the next ten years. (Over 90% of Canada-U.S. pulp and paper trade is duty-free already. Tariff protection exists only for such grades as boxboard, containerboard, sanitary papers, fine papers, and some specialty papers. The Canadian tariffs range from 2.5% to 9.2%, while U.S. tariffs run from 1.6% to 4%.)

Gilles Rheaume, director of forecasting and analysis for the Conference Board of Canada, expects business will require an adjustment period of five years—including additional capital investment—if the free trade agreement is enacted.

RECORD CAPITAL SPENDING. Canadian companies have already begun to respond to the need to upgrade with 1989 capital spending plans breaking records for the second year in a row. Statistics Canada indicated late in 1988 that Canadian paper companies intended to spend C$3.77 billion in 1988 for new plants and equipment, up 53.8% from the year before. Quebec was the province with by far the highest capital spending bill—an estimated $1.09 billion in 1988. British Columbia, though, showed the greatest rise in spending, up 90.7% to $919.3 million.

Judging by the number of capital projects currently planned, spending will continue strong beyond 1988. An estimated $6.5 billion in approved projects were in the pipeline late in 1988 for completion during the next two years. Of $9.07 billion in projects planned for the 1988-92 period, 38% are scheduled for completion in 1989 and 35% in 1990. Clearly, companies plan to keep spending high over the next few years.

This will not only allow producers to offer products that are more competitive in a world marketplace in terms of quality but also enable mills to operate more efficiently. Manufacturing costs per unit should drop, and better technology will lead to better use of the dwindling fiber base. Quality will be better from new and upgraded machines, which will lead to the conversion, upgrading, or shutting down of units that are older and less efficient.

Forest products companies have been negotiating more modest labor agreements in recent years to substantially improve operating costs as well as efficiencies, although the contract ratified in British Columbia last summer was considered to be more expensive than many industry observers felt was justified. The industry's historical penchant for labor disruptions should not pose a problem in 1989, though. Bargaining agreements covering most mills in the East and West are not due to expire until 1990 and 1991, respectively.

CAPACITY RISING. Total paper and board capacity in Canada will increase by 2.5 million metric tons and market pulp capacity will rise by 1.135 million tons, each showing a 14.6% growth over the period 1987-90, according to the most recent Canadian Pulp & Paper Assn. annual capacity survey. During the three-year period, capacity additions in newsprint amounting to 3.2% annually were expected to lead to oversupply as early as second-half 1989.

Total pulp capacity will grow 9.8%, or 2.4 million tons, during this time. Market pulp capacity alone will rise by 2.9% annually over the same period—more than twice the rate attained over the 1977-87 period, but this may not glut markets, except possibly the chemi-thermomechanical pulp (CTMP) sector.

Jaak Puusepp of Pemberton Houston Willoughby Bell Gouinlock Inc., Vancouver, B.C., feels CTMP producers' hopes may be riding on a projected fiber supply shortfall. Some industry analysts say that pulpwood supplies—especially in Canada and particularly for such grades as kraft—are dwindling faster than many realize. "Given this [fiber constraint], all incremental fiber will be developed along the highest-yielding processes [mechanical, thermomechanical, and CTMP], rather than the chemical processes," he noted.

Richard Kelertas, forest products analyst with Scotia McLeod, Toronto, Ont., foresees a shortage of chemical pulp as early as 1995 and expects the Canadian industry to make fiber-related issues a priority. "The industry will be making some key decisions on fiber development now that the federal and provincial governments are spending less and less on the forest products industry and extracting more money in terms of stumpage. There will be major decisions on forest management expenditures also," he noted.

MARKETING EFFORTS STRESSED. Other issues facing the Canadian industry in 1989 will be higher spending on R&D, better training for workers, more computer process control, and a substantial revamp of sales and marketing, according to Kelertas. "They're being forced to [make improvements]," said Kelertas. "It's a global industry now and it's being currency driven, and there's no excuses if we have a free trade agreement. Everyone is going to have to be as competitive as possible. The buzzword will be service, service, and more service."

The Canadian industry is also concerned with increasing competition in overseas markets. Beginning in 1992, the 12 member countries of the European Economic Community plan to eliminate the tariff barriers among themselves. Outside countries, particularly in Scandinavia, are already seeking closer ties in Europe. Some Canadian companies, such as Cascades Inc. and Consolidated-Bathurst Inc., are investing more heavily there.

Other Canadian producers, including as Abitibi-Price Inc., Noranda Forest Inc., and Canadian Pacific are also diversifying more into other regions, such as Venezuela, Tasmania, and the U.S. Resources are being pooled among mills, outside investors, and even customers—both domestic and foreign—to improve competitive strength in global markets.

Meanwhile, the industry at home continues to restructure through mergers and acquisitions while spinning off less-profitable assets, and foreign investment has been on the upswing. These trends should continue as producers attempt to position themselves in a changing and increasingly competitive world marketplace.

"It's been a year of contrasts—ups and downs—and, surprisingly, the industry has come through in a very resilient manner," noted Kelertas. "I think the Canadian industry can compete and will compete—even with an 83¢ dollar," he added.

NEWSPRINT

CYCLE CHANGES AGAIN AS DEMAND DROPS

■ The newsprint industry boom drew to a close along with the end of 1988, and this downward trend is expected to continue during 1989. The upturn that began late in 1986 with rising industry earnings, improved demand, and higher prices began to reverse itself in second-half 1988. Substantial capacity additions and relatively flat consumption this year appear likely to depress the market by year-end and continue through 1990.

North American newsprint capacity is expected to rise by 1.759 million metric tpy, or 11.4%, during 1987-90, according to a recent Canadian Pulp & Paper Assn. annual capacity survey. "Newsprint capacity will show a higher rate of increase in the period under review than we have witnessed for several decades," CPPA noted.

Trouble with the market began last spring as the output from mills running close to capacity since early 1987 began to result in rising inventories. At the same time, publishers were starting to see the results of their efforts to conserve newsprint, and their own newsprint stocks were growing. The resulting ease in demand in the U.S. began to create spot markets, with mills offering distressed prices for tonnage they were unable to sell to contract customers.

After three newsprint price increases since first-quarter 1987 resulting in about a 22% rise in transaction levels (U.S. East), publishers began to fight back. Newsprint costs were rising faster than ad revenues at a time when newspaper industry profits overall were dropping, primarily due to competition from other advertising media.

Newspapers in major cities suffered substantial losses in circulation. Late in 1988, the Audit Bureau of Circulation indicated that during the six-month period ending Sept. 30, 1988, 12 of the top 25 daily newspapers and 11 of the top 25 Sunday papers in the U.S. posted losses in circulation.

National ad space in newspapers is expected to decrease 2% in 1989, according to a recent forecast from Branham Newspaper Sales. The slippage is part of the trend to mergers and acquisitions in the retail industry, a reduction in financial ads due to the October 1987 stock market plunge, and reduced earnings in major industries such as tobacco, it was noted.

NEWSPRINT CONSERVATION TREND. Publishers will be lean on newsprint consumption this year—with a growth of less than 2% projected by most analysts—for reasons other than ad projections. They have found ways to cut newsprint usage to lower operating costs. Many have simply reduced their waste by such methods as better control on the presses. Basis weight was decreased by major customers, such as Dow Jones. Marginal circulation and special editions were eliminated. News holes—the ratio of editorial content to ad space—were trimmed. And some even narrowed the width of their pages.

By mid-1988, the results became apparent. Consumption had begun a downward trend in April that continued for at least six months. According to American Newspaper Publishers Assn. figures, U.S. daily newspaper consumption of newsprint dropped 3.2% in September, the sixth consecutive decline compared with year-earlier totals. This brought total consumption through the first three quarters down 0.4%.

At the same time, a panic associated with projected North American capacity increases during 1989-92 was causing newsprint producers to negotiate long-term supply agreements with substantial discounts. As the year progressed, prices continued to erode. By year-end, even the buyer of as little as 1,000 metric tpy was getting a 2% discount in the East. The West, though, maintained discount levels of 7% to 8% (including a 5% full-contract-amount discount) for volume buyers of 10,000/20,000 tons or more (varying mill to mill). In the East, 40,000-tpy contracts could draw 12% discounts, and the biggest discounts were said to be as high as 20% for the highest volume purchasers. Spot market discounts, meanwhile, were as high as 24%.

PRICE HIKE PROSPECTS UNCERTAIN. Despite these apparent signs of eroding markets, the industry announced a $45/metric-ton price increase for Jan. 1, led by the Canadian mills wanting to recoup losses from a higher Canadian currency. Practically all of the Jan. 1, 1988 price increase was eroded for Canadian producers by the Canadian dollar rising to US$0.82 during the year.

Toward year-end, though, the industry began to reduce the amount of the hike to about $30/metric ton and rollback to Feb. 1 in the East and Apr. 1 in the West. This would bring list prices to $630 in the West and $680 in the East. But even if some mills stick to Jan. 1 or Feb. 1, prices will probably be delayed for some customers until Apr. 1 or later. Some industry analysts don't expect the price increase to hold at all; others believe that if it is successful on the books, the discounts will more than offset any net gain in actual transaction levels.

For much of the year, transaction levels remained at about $610 in the East and $600 in the West, after taking into account an average weighted discount of about 6.5% in the East and the full-contract-amount discount of 5% in the West. But by early in the fourth quarter, the eastern price was eroding. Discounts were rising 2% to 3% or more, reducing the market price to about $600 by year-end. In the West, discounting was not as severe, but market prices were slipping to about $590 by year-end.

BUYERS GAIN MORE BARGAINING CLOUT. Part of the problem with raising newsprint prices has been an increasing concentration of the customer base that allows "most of the larger chains . . . to use their clout in the marketplace to maximize their operating profits," noted Jim Rowland, editor of the *Canadian Paper Analyst*, Toronto, Ont.

With the U.S. market apparently headed for a glut period over much of the next two to three years, producers will be looking to market their output in other areas. However, significant capacity additions planned in regions such as Europe and Japan seem to be gearing toward making those regions self-sufficient or in a surplus position. European newsprint capacity will increase 11% between 1988 and 1992, with another 18% proposed but not finalized. At the same time, consumption is expected to grow just 9.2%, according to European Paper Institute figures.

Roger N. Wiewel, senior vice president of MacMillan Bloedel Ltd., indicated that the projected world expansion of newsprint would add about 18% to world capacity at a time when demand appears to be slowing due primarily to the sluggish growth in the insert market. He believes North America will experience overcapacity, with Canadian operating rates dropping to below 90% during 1990-92.

Abitibi-Price Inc. indicated at an anaylsts' meeting in late November that it expected U.S. and Canadian newsprint industry operating rates to drop to about 94% this year, compared with 98% to 99% in 1988. Operating rates in both countries were expected to continue to decline to about 92% in 1990 and about 90% in 1991 and 1992.

UNCOATED GROUNDWOOD

A MODERATELY GOOD YEAR

■ North American demand and prices for uncoated groundwood papers climbed upward in 1988 even as some new and converted paper machines came online or reached design capacity. The full effect of this new tonnage will be felt this year and next. This is particularly true of paper closely related to newsprint, which is already abundant. Groundwood paper markets may therefore undergo a leveling off in both price and demand, industry sources say.

In fact, slow economic growth in the U.S. will mean lower operating rates and possibly some price discounting, according to Brian Topp, an analyst with Capital Group Securities, Toronto, Ont. The slowing growth was apparent by the end of 1988, and North American mills will have a difficult time this year achieving price increases, Topp said.

Production and shipments of groundwood specialty grades at Canadian mills continued their strong advances for the first three quarters of 1988, the Canadian Pulp & Paper Assn. reported. Production for the first nine months was 13.8% above year-ago figures, while overall shipments rose 12.7% for the same period, CPPA said.

The strength of the U.S. markets helped increase January-to-September exports to the U.S. by 12.9% (to 882,000 metric tons), while domestic shipments (172,000 metric tons) were up 14.7%. Other exports advanced 7.4%. Despite a jump in mill inventories, most machines are running full out, or close to it, and are shipping most of that tonnage.

U.S. mills also reported continuing increased shipments, about 4.8% for the first nine months of the year compared with 1987, the American Paper Institute said. API figures put new orders growth at 1.8% and mill inventories negligibly higher.

Capacity expansion continues in both Canada and the U.S. CPPA estimates that groundwood printing and specialty paper capacity will rise 8.6% this year after a 11.0% jump in 1988 from 1987. Such an increase would put Canadian capacity at 1.64 million tons in 1989. Groundwood paper capacity is expected to advance another 11% in 1990 to 1.82 million tons.

Major expansion projects include a new supercalendered (SC) paper machine started up in fall 1988 by St. Marys Paper Inc., Sault Ste. Marie, Ont., which will add 125,000 tpy of capacity after shutdown of an existing machine. St-Raymond Paper Ltd. is reactivating the idle 70,000-tpy Pejepscot mill in Maine. This year, Consolidated-Bathurst Inc. will start up a new 183,000-metric-tpy machine at Grand'Mère, Que., which will produce a range of high-quality newsprint and groundwood paper grades. The project will add about 112,000 tpy net after shutdown of two older machines. In the U.S., Daishowa America is studying a possible new 150,000-tpy directory paper machine at Port Angeles, Wash., and Lake Superior Paper Industries, partially owned by Pentair Inc., is contemplating a second high-filled SC machine similar in size to the 240,000-tpy machine that started up in late 1987.

WILL CAPACITY OUTPACE DEMAND? Fairly stable growth rates of 5%/year are expected for the next several years in major end-use markets for uncoated groundwood. Mild or even negative economic growth and high availability of newsprint may affect some sales of uncoated groundwood grades. One estimate indicated demand increasing 500,000 short tons by 1990, but capacity growth will be 934,000 short tons.

Within the individual markets, SC paper shows the brightest promise. Additional capacity and higher-quality paper, especially on the top end, could help SC grab some market share from coated groundwood grades, should prices continue upward or should printers and end users look for cost-cutting measures during an economic downturn. In fact, SC papers may account for about 16% of the catalog paper market by 1995, up from 4% in 1986. Some of that growth will come at the expense of the machine-finished grades as well as from the general growth in catalogs.

Directory paper producers may be able to take some advantage of continuing growth in telephone directories and lightweight catalogs. The number of titles and the distribution of telephone directories are forecast to increase 32% and 9.4%, respectively, from 1987 to 1993, according to a study prepared for Graphic Arts Marketing Information Service (GAMIS). The report, prepared late last year by D. Gentile Associates, Centerport, N.Y., said that, the total number of pages per directory will be 9% to 10% higher. Most paper used will continue to be uncoated groundwood.

The GAMIS study also indicated that the use of yellow directory paper will grow. In 1987, Yellow Pages directories accounted for 52% of total directory pages. That figure will rise to 62% by 1993, the report said. At the same time, white pages will decline from 43% in 1987 to 33% in 1993.

Office electronics are creating new opportunities for groundwood producers who manufacture basestocks for computer forms. The number of small, inexpensive computer printers is expected to grow rapidly.

STRONG GROWTH FOR INSERTS. The major commercial printing side—preprinted inserts and flyers—is expected to continue high growth rates of at least 5% annually, and more likely 6.5% or even higher, through 1992, most industry sources say. "It's one of the fastest growing areas of printing," said Jim Workman, assistant manager of techno-economic forecasting at the Graphic Arts Technical Foundation (GATF). Workman said that in 1986, paper for inserts was worth $2 billion and should be worth $2.6 billion by 1989. "We're anticipating about a 5% to 6% increase for '89," said Gene Dunsirn, director of purchasing at Quad Marketing. As a result, one industry estimate puts growth for paper consumption used for coupons at over 7.5% from 1988 to 1989 and for catalogs at a whopping 23%.

Paper consumption for inserts and flyers, excluding coupons and catalogs, should rise 7.2% to almost 2.5 million tons in 1989 from 1988, according to Eric Edelmann, vice president, Walker Wiener Associates Inc. (WWA), a market research firm. GATF put total 1986 paper consumption at roughly 3 million tons, and another industry source estimated 1989 paper consumption at over 3.5 million tons for this category.

TABLE 4: **New North American uncoated groundwood capacity.**

Company	Mill	Tons	Grade	Startup
Madison	Madison, Maine	20,000	SC-A	1988
St-Raymond	Pejepscot, Maine	70,000	Specialties	1988
St. Marys Paper	Sault Ste. Marie, Ont.	130,000	SC-A/B	1988
Soucy	Rivière-du-Loup, Que.	20,000		1988
St-Raymond	St-Raymond, Que.		Directory	1988
Abitibi-Price	Alma, Que.	60,000	Directory	1989
Con-Bathurst	Trois Rivières, Que.	30,000	SC	1989
Kruger	Trois Rivières, Que.	33,000	SC	1989
Con-Bathurst[1]	Grand'Mère, Que.	125,000	Specialties	1990
Kruger	Corner Brook, Nfld.	77,000	SC-B/C	1990
Daishowa[2]	Port Angeles, Wash.	120,000	Directory	n.a.
Lake Superior[2]	W. Duluth, Minn.	240,000	SC-A	n.a.
Cascades[2]	Port Cartier, Que.	231,000	SC-A/B	n.a.

1. Includes high-quality newsprint grades.
2. Proposed or under study.

Edelmann said the second largest chunk, after newsprint, was SC paper, which represents about 22.9% of 1988 tonnage. This is followed by coated groundwood at 16.7%, coated free-sheet at 12.6%, uncoated groundwood other than SC at 11.8%, and uncoated free-sheet at less than 0.3%, according to Edelmann. GATF's Workman had similar figures for coated groundwood, SC, and coated free-sheet but much higher figures for uncoated free-sheet and machine-finished groundwood grades.

WWA forecasts the strongest growth for SC paper, which accounts for about 524,800 tons of insert/flyer paper in 1988. Consumption of SC for this use is expected to jump 11.7% in 1989 from this year, compared with 9.2% for coated free-sheet, 8.8% for coated groundwood, 6.9% for uncoated free-sheet, 4.1% for other uncoated groundwood grades, and just 2.6% for newsprint.

Prices on all grades rose substantially in 1988, but most observers expect only a single price hike in 1989. Prices could be subject to discounting as the economy turns down or as more newsprint becomes available.

MARKET PULP

LOOKING FOR THE NEXT DOWNTURN

■ Pulp prices have been on an incredible roll—nearly doubling over the last three years. But instead of enjoying their newfound prosperity, industry executives and analysts are beginning to worry about when the next market down cycle will begin.

The price of market pulp has risen almost every quarter for three years, and producers recently announced another price increase for first-quarter 1989. The latest increase would be $40/metric ton in the domestic market and $50 in Europe and Japan. This would take the price of benchmark northern bleached softwood kraft (NBSK) pulp to $800/ton in the U.S. and to $810 in export markets. Since the end of 1985, the price of NBSK will have roughly doubled from the lows reached in the last market downturn.

The main factors that are driving the dramatic rise in pulp prices have been tight supply and the falling value of the U.S. dollar. Although the pulp market may have eased a bit since last summer, North American and Nordic producer inventories of chemical paper-grade market pulp at the end of November still were at only 836,000 metric tons. Meanwhile, Canadian and U.S. market pulp mills continue to struggle to keep up with demand, running at close to 100% of capacity.

The decline of the dollar since last fall set the stage for the latest pulp price increase. As occurred in many previous quarters over the past three years, the drop in the dollar opened a large gap with local currency prices. And with pulp still in tight supply, North American producers raised prices to close the gap. Even with the latest increase, the new $810 price of North American producers in Europe in early December was still about $15/ton below prevailing local currency prices of Nordic producers in Europe.

PRICE FREEFALL? Most industry analysts believe the pulp market is near its peak, although another price increase in 1989 is possible if the U.S. dollar continues to decline. For example, Rodney Young of Resource Information Systems Inc. expects world demand for chemical paper-grade market pulp to slow in 1989 as an economic recession hits in the second half of the year.

He expects a 2% increase in world pulp demand this year, resulting in an average operating rate for the year of 96%. This compares with a 4% increase in demand in 1988, with utilization rates close to a record 97% to 98%. Young believes chemical paper-grade pulp prices will begin to show weakness in third-quarter 1989, led by hardwood grades.

The weakness then may spread to NBSK in the fourth quarter, with pulp prices going into a free-fall in 1990. By early 1991, Young expects the price of NBSK to have dropped about $200/metric ton from its expected peak in first-quarter 1989. This will still leave North American pulp producers "in pretty good shape" as far as profitability is concerned, but Nordic producers would be at or slightly below the break-even level, according to Young.

Another analyst who believes market pulp prices could possibly begin to weaken late next year is Ross Hay-Roe, editor of *PaperTree Letter*. He notes that inventories of purchased pulp at U.S. paper mills have begun to rise (reaching 628,000 short tons in September 1988, up about 100,000 tons since last spring). "Such inventory changes may be an early indication that the turning point in this excruciatingly tight pulp market is not far off," notes Hay-Roe. "But there's a long lag between a rise in customer inventories and any weakness in prices." By late 1989, however, "we might see prices begin their normal downward slide, with hardwoods leading the way."

The doubling of pulp prices over the past three years has not had much impact on buyers in Europe and Japan in their own currencies due to the declining dollar. But North American pulp buyers have had to absorb the full impact of the $400/ton rise in pulp over three years, and they can be expected to try to leverage prices down. This is true of buyers in many Third World countries whose currencies tend to move with the U.S. dollar.

CTMP WILD CARD. One factor that may cause difficulties for the market this year is about 750,000 tpy of new bleached chemi-thermomechanical pulp (CTMP) capacity starting up in Canada over the 1987-89 period. This would include production from four new mills (Cascades Inc., Millar Western Pulp Ltd., and Fibreco) plus two mills that have recently been expanded or upgraded (Consolidated-Bathurst Inc. and Quesnel River

Pulp Ltd.). Since markets for this new grade are not well established, producers may have to offer competitive prices to interest buyers in trying this new pulp.

While not much new chemical market pulp capacity will be starting up this year, substantial production will be coming onstream during the early 1990s. According to a recent tabulation in *PaperTree Letter*, only about 1.2 million tons of new chemical paper-grade pulp capacity will be coming onstream worldwide during the 1988-89 period. But in 1990-91, about 3.37 million tons will be added, followed by another 3.2 million tons in 1992-95. Most of the new capacity, about 80%, will be hardwood pulp, Hay-Roe estimates.

If there is no recession in 1989, the pulp market could remain strong for at least another year or longer, Young notes. But this would probably encourage even more expansion activity that would come back to haunt producers in the early 1990s. One law of physics that seems to apply to the unpredictable pulp market: what goes up must (eventually) come down.

LABOR

RELATIONS ARE STRAINED

Last October, the United Paperworkers International Union unconditionally ended its 16-month strike against three of International Paper Co.'s mills. The end of the strike highlighted some truths about labor-management relations:

- Companies will run their mills with salaried people or replacement workers in the event of a strike.
- Premium pay for Sunday and holiday work is becoming a thing of the past.
- The pooled voting strategy attempted by several UPIU locals working for IP wasn't successful.

UPIU ideally would like to negotiate on a national level with IP and other paper companies. This would give it more clout, similar to what union members in Canada enjoy when they negotiate new contracts. It would require that contracts at a company's mills lapse at the same time, however, and companies are not likely to acquiesce.

In November, all locals employed by IP, regardless of what union they belonged to or their current bargaining status, were invited by UPIU to join a pool to coordinate their bargaining. The international of UPIU will supervise the bargaining to seek four goals for all IP mills: ensure rehire of all ex-strikers, prevent subcontracting of existing permanent jobs, maintain current premium pay for Sundays and holidays, and maintain current length of contract. UPIU locals that worked for IP and Georgia-Pacific Corp. attempted this in 1987, but they were not successful.

Pooled voting may also be used this year by locals negotiating with Champion International Corp., Boise Cascade Corp., Temple-Inland, and Packaging Corp. of America. Locals were voting on this late last year. Each local would retain its decision-making power, but key issues decided on at the outset would be dealt with in a coordinated way. Premium pay continues to be one of the union's big concerns at all of these companies, as does preventing total work rule flexibility.

BUSY YEAR FOR LABOR. This year, 120 U.S. mills will be negotiating new contracts, compared with 84 in 1988. Labor consultant Julian M. Kien noted that labor's agenda in 1989 includes support for child-care provisions, parental leave, retiree benefits, and possible further tightening of the plant closure notification bill (see p. 200). Labor will also be part of the coalition pushing for mandatory health insurance. It will work to pass a bill that was presented last year by Rep. Joseph Brennan, D-Maine, that calls for a 70-day waiting period before a company can hire permanent replacements for strikers. As of November, the bill had 14 cosponsors. A new bill that would strengthen OSHA's health and safety rules for the workplace is also expected to be a major issue.

The industry will pursue its cost-cutting agenda and negotiate an end to premium pay for Sundays and holidays in more contracts. As of late 1988, about 70 mills in the U.S. had eliminated Sunday premium pay. More mills are seeking to implement flexible work rules as well. Companies are making an effort to keep their employees informed about the competitive situation of their mills. A good example of this occurred last fall, when Kimberly-Clark Corp. informed mill employees at Coosa Pines, Ala., that the mill was a high-cost producer and modernization was needed to maintain it as a viable enterprise. Union members agreed to accept work rule changes, and K-C agreed to spend $200 million to modernize the mill.

The average first-year wage increase in 1988 was 0.7%, compared with 0.4% in 1987, according to American Paper Institute statistics. The average second-year increase was 2.0%, inching up slightly to 2.1% in the third year. This compares with 1.5% and 1.6%, respectively, in 1987 contracts. First-year increases will continue to be curtailed in 1989 bargaining, as companies' practice of giving lump-sum payments in lieu of a first-year increase is now a permanent fixture of bargaining.

vide specific limits on dioxin. Data from the 104-mill study will be provided to states to help them formulate requirements. It is unlikely that all mills will be facing limits on dioxin discharges this year unless EPA becomes more involved in setting limits. The Office of Technology Assessment will issue a report early this year on dioxin and chlorine use in the pulp and paper industry that may cause Congress to call for specific regulations.

Last November, API said it had identified ways to eliminate concerns related to dioxin in the manufacture of bleached paper products. It said a range of options can be implemented by mills, including strictly controlling the amount of elemental chlorine used, substituting other bleaching agents for chlorine, and installing or modifying prebleaching processes, such as using extended or oxygen delignification. API estimates that it will cost mills about $1 billion total to implement these changes over a two- to three-year period.

CANADIAN TESTING BEGINS. This year, tests will begin on the effluent, sludge, and pulp at Canada's 47 bleached pulp mills. Until this data is gathered and analyzed, limits on dioxin in mill effluent will probably not be promulgated. The Pulp & Paper Research Institute of Canada conducted a study last year that it said shows certain types of oil-based defoamers used in the brownstock washing stage cause the formation of precursor compounds that in turn form dioxin when chlorine is added.

In addition to using the right kind of defoamer, the 47 bleached pulp mills will spend approximately C$10 million each over the next two years in order to alter their facilities. Most of the money will probably go toward chlorine dioxide generators. Early this year, the National Dairy Council of Canada will launch a nationwide test for dioxin in milk that is packaged in solid bleached sulfate board, the majority of which is imported from the U.S.

PULPWOOD

CHIP PRICES ON THE RISE

Housing starts in the U.S. through the first ten months of 1988 were running at an annual rate of 1.55 million units, compared with about 1.62 million starts in 1987. Housing starts for all of 1988 were forecast to be about 1.48 million units. Starts in 1989 are forecast to be about 1.3 million units, which will reduce woodchip supplies since less timber will be milled.

The drought and the woodworkers strike in the Pacific Northwest conspired to curtail logging in that region last summer and has left many people praying for a good winter so inventories can be rebuilt. Woodchip supplies at pulp mills continue to be ample, but the price of Douglas fir chips has risen to around $63/bdu delivered to pulp mill. The export price of Douglas fir chips to Japan for the first half of this year is forecast to increase again—it rose $7.50/bdu last July to $86.70/bdu f.o.b.

Sawmills in the Northwest are having to pay more for their timber because of offshore demand from Japan, Rep. Korea, and People's Rep. China. Public timber supplies are dwindling as the U.S. Forest Service lowers the amount of allowable cut. Legal action taken by environmental groups has also held up logging in the Northwest. These factors are driving up the price of timber in the region and could cause some sawmills to shut down, reducing the chip supply. WTD Industries Inc. is planning to build a pulp mill in Oregon, and Pope & Talbot Inc. is planning a major addition to its pulp mill in Halsey, Ore., so chip supplies in that region are forecast to become tighter.

The timber supply in the South is shifting from softwood to hardwood. The price of hardwood chips in the region has gone up about 17% (Table 5). Hardwood chips are much in demand in the Far East. They are being sold to Japan and Taiwan via the ports of Lake Charles, La.; Mobile, Ala.; Savannah, Ga.; and Morehead, N.C. Even adding ocean freight, woodchips exported from the southern U.S. and Chile are cheaper than domestic chips in Japan. Pulp mills in the South will also be competing with reconstituted panel producers for chips and possibly roundwood.

TABLE 5: **Slower housing starts increased woodfiber costs in '88.**

	1Q	2Q	3Q	% change 3Q '88/ 3Q '87
West Coast U.S. Douglas fir chips (f.o.b. export prices to Japan)	$79.20	$79.20	$86.70	13.5%
Roundwood, pine[1]	42.84	42.94	43.00	n.a.
Roundwood, hardwood[1]	36.03	35.40	37.12	n.a.
Greenchips, pine, clean[1]	20.84	20.34	20.56	9.6
Greenchips, hardwood, clean[1]	16.98	17.01	16.50	17.4

1. Source: *Timber Mart–South.* Roundwood prices are f.o.b. yard, no freight, no yard cost. Chip prices are f.o.b. sawmill.

n.a. = not available.

ISSUE FOCUS: **CAPITAL SPENDING**

CAPITAL SPENDING SURVEY: 1988-90

Capacity expansion is the focus of record spending plans in both the U.S. and Canada, with major programs stretching well into the 1990s

By CARL ESPE, News Editor

Capital spending is booming in the North American pulp and paper industry, according to *Pulp & Paper's* annual survey of investment plans. Strong demand and record prices for most grades have led to record profits at U.S. and Canadian paper companies, providing the funds for ambitious modernization and expansion programs. If paper companies fear a recession around the corner—as do many economists—they are not showing it in their capital spending budgets. Last year, paper companies largely ignored the stock market crash when formulating their spending programs. This year, there appears to be a similar lack of concern about prospects for a downturn in the economy.

Capacity expansion is the driving force behind the spending boom. Newsprint leads the way in both the U.S. and Canada, but other grades are heating up. In the U.S., high prices and tight markets have led to renewed expansion activity in the containerboard sector and in kraft market pulp, both of which saw below-average growth for most of the 1980s. In Canada, strong growth continues in market mechanical pulp and white paper, and growth is accelerating in kraft market pulp as well.

Overseas investors attracted by weak domestic currencies are an important factor in current expansion plans. Pacific Rim companies from Japan, Rep. Korea, New Zealand, and Australia have committed hundreds of millions of dollars to expansion projects under way in the U.S. and Canada. This trend—relatively rare in the U.S. up till now—could become increasingly common if the dollar remains weak. The Japanese, in particular, have tremendous buying power in North America.

Environmental compliance spending is another area that is heating up as states and provinces formulate new regulations in such areas as odor control and discharge standards. The major problem of dioxin in kraft pulp mill effluent—still being studied by government agencies—will cost the industry over a billion dollars in the U.S. and almost half a billion in Canada, according to American Paper Institute and Canadian Pulp & Paper Association estimates.

P&P's latest investment survey, conducted in November, primarily covers spending plans for the three-year period from 1988 through 1990, along with a few longer-range projects. U.S. companies report plans to spend $13.69 billion on capital projects at pulp and paper mills during the survey period, an increase of 70% over spending plans reported in last year's survey for 1987-89. Planned 1988-90 outlays in Canada total C$9.92 billion, up 49% from last year. Projects scheduled for completion in 1991 and 1992 account for 18% of total spending in the U.S. and 12% in Canada.

Forecast sounds a cautious note. A recent Data Resources Inc. study found that U.S. pulp and paper companies plan to spend $11.46 billion on capital projects in 1989, up 4.8% from estimated 1988 spending of $10.93 billion. While still a new record, that level of spending would signal a marked cooling off from the heated activity of 1988, when spending climbed 21.3%, compared with 1987. In addition, DRI reports that companies plan to trim spending in 1990 to $10.76 billion, down 6.1% from this year. Conducted from September to November, the DRI study was based on responses covering 9.6% of the industry's spending plans. Results for the paper industry are in line with other manufacturing sectors. Overall, manufacturers plan a 4.7% increase in capital spending this year, DRI reports.

Spending up sharply in Canada. As in the U.S., spending programs in Canada have been lifted by record prices and continuing tight markets for most grades. So far, the rise in the value of the Canadian dollar relative to the U.S. dollar has not visibly affected spending plans in Canada. Interest in new capacity-expanding projects continues to run high, fueled in many cases by foreign companies that are less affected by the ups and downs of the Canadian dollar.

Canadian pulp and paper companies planned to spend a record C$3.77 billion on new plant and equipment in 1988, according to the latest government survey of spending plans, completed by Statistics Canada in July. That represents a 53.8% increase over 1987, when

Complete results of P&P's exclusive survey of North American capital spending programs for 1988-90 are available in a separate Mill-by-Mill Listings report. Organized by company, the listings show programs for new mills and machines, rebuilds and modernizations, environmental quality control, and other mill improvements, with specifics on equipment ordered, dates, suppliers, and prices, where available. Subscribers to P&P's monthly newsletter, Project Report, receive a free copy of the report with their January issue. All others may obtain a copy of the report for US$145. To order, send payment to Pulp & Paper, Editorial Dept., 500 Howard St., San Francisco, Calif. 94105.

companies spent a record $2.45 billion on capital projects. Except for a 7% dip in 1986, capital outlays have risen every year in Canada since 1983.

New machinery accounted for 84% of planned expenditures in the Statistics Canada survey, totaling $3.17 billion. Construction costs were pegged at $598 million, or 16% of overall outlays. These figures are up 48.4% for machinery and 91.0% for construction, compared with 1987.

Spending plans were up 16.8% from late 1987/early 1988, when companies reported plans to spend $3.23 billion on new plant and equipment in 1988. The lion's share of these revisions is in the construction area, where spending plans jumped 60.1%. Planned outlays for new machinery were revised upward only 11.1%.

ABOUT *P&P'S* ANNUAL SURVEY. Now in its twenty-fifth year, *P&P*'s annual capital spending survey covers expansion and modernization programs at U.S. and Canadian mills. Unlike surveys that track spending by year, this survey covers spending by project. Dollar figures represent the total cost of reported projects and may sometimes include supporting equipment. The total cost of multiyear projects is assigned to the startup year and is not divided among the years of expenditure. Each survey primarily covers a three-year period—the current survey covers 1988-90—but projects with firm startup dates beyond that time frame are included. ■

UNITED STATES

AMBITIOUS EXPANSION PLANS FUEL RECORD SPENDING INTO THE NEXT DECADE

■ By just about any measure, capital spending is booming in the U.S. pulp and paper industry. U.S. mills report plans to spend $13.69 billion on modernization and expansion projects over the next several years. That total is up over 70% from this time last year, when mills reported plans to spend $8.04 billion on capital projects. Companies report another $1.84 billion worth of proposed projects under active consideration but not yet approved with startup dates (these proposed projects are not included in *P&P*'s spending breakdowns). Broken down by year, spending totals $2.47 billion for projects completed in 1988, $3.21 billion for those scheduled for 1989, $5.00 billion for 1990, and $2.43 billion for 1991 and 1992.

Record earnings and continued strong demand are the most important factors in the investment upswing. Capital spending is tied strongly to cash flow, and companies expect another good year of high prices and strong demand, which will keep cash flows up and provide funds for higher capital outlays. Capacity expansion is the focus of a growing number of spending pro-

U.S.—REPORTED CAPITAL EXPENDITURES FOR 1988-90+ BY REGION AND TYPE OF FACILITY ($000)

PRODUCTION-RELATED EXPENDITURES

	WOOD/FIBER		PULPING		NEW MACHINES		REBUILDS		ENERGY		PLANT	
New England	5,000	1%	340,200	7%	250,000	7%	287,900	14%	368,900	27%	68,460	9%
Mid-Atlantic	0	0%	17,250	0%	0	0%	92,406	4%	122,427	9%	2,609	0%
East North Central	0	0%	155,747	3%	872,350	23%	347,031	17%	83,540	6%	169,030	21%
West North Central	50,000	11%	333,315	7%	578,455	16%	26,000	1%	8,976	1%	60,854	8%
South Atlantic	100,675	21%	1,486,640	32%	914,313	25%	604,385	29%	338,170	25%	194,830	25%
East South Central	215,190	45%	1,285,655	28%	455,175	12%	432,500	21%	261,840	19%	199,355	25%
West South Central	44,300	9%	353,500	8%	350,125	9%	204,800	10%	20,900	2%	34,036	4%
Mountain/Pacific	58,140	12%	610,140	13%	298,750	8%	92,814	4%	148,500	11%	64,158	8%
Total	**473,305**		**4,582,447**		**3,719,168**		**2,087,836**		**1,353,253**		**793,332**	

ENVIRONMENTAL QUALITY SPENDING

	WATER		AIR		SOLID WASTE		PRODUCTION		ENVIRONMENT		TOTAL	
New England	0	0%	1,550	1%	9,800	23%	1,320,460	10%	11,350	2%	1,331,810	10%
Mid-Atlantic	2,540	1%	7,500	3%	1,055	2%	234,692	2%	11,095	2%	245,787	2%
East North Central	10,732	3%	11,948	5%	7,870	18%	1,627,698	13%	30,550	4%	1,658,248	12%
West North Central	4,752	1%	10,752	5%	396	1%	1,057,600	8%	15,900	2%	1,073,500	8%
South Atlantic	238,958	57%	24,804	11%	9,446	22%	3,639,013	28%	273,208	40%	3,912,221	29%
East South Central	86,230	21%	86,300	40%	8,600	20%	2,849,715	22%	181,130	27%	3,030,845	22%
West South Central	10,800	3%	16,370	8%	900	2%	1,007,661	8%	28,070	4%	1,035,731	8%
Mountain/Pacific	65,890	16%	58,140	27%	4,770	11%	1,272,502	10%	128,800	19%	1,401,302	10%
Total	**419,902**		**217,384**		**42,637**		**13,009,341**		**680,103**		**13,689,444**	

States are assigned to regions as follows:
New England: Maine, Vt., N.H., Conn., R.I., Mass.
Mid-Atlantic: N.Y., N.J., Pa.
East North Central: Wis., Mich., Ill., Ind., Ohio
West North Central: N.Dak., S.Dak., Nebr., Kans., Minn., Iowa, Mo.
South Atlantic: Del., Md., W.Va., Va., N.C., S.C., Ga., Fla.
East South Central: Ky., Tenn., Miss., Ala.
West South Central: Okla., Texas, Ark., La.
Mountain/Pacific: Wash., Ore., Calif., Alaska, Idaho, Nev., Mont., Wyo., Utah, Ariz., Colo., N.Mex.

grams across virtually the entire spectrum of grades. In addition, high market pulp prices have led to an increase in pulping projects to expand tonnage for both internal use and sale. New state regulations in such areas as odor control and discharge standards will focus attention on environmental spending as well. For example, the state of Georgia has issued air quality standards that could force major air-quality spending programs at kraft pulp mills in the state by the early 1990s. Programs to rid pulp mill effluent of dioxins will also keep environmental spending high.

Production-related spending totals $13.01 billion in the current survey, up 71% from last year. Broken down by process area in the mill, the largest gains are in pulp mill spending, followed by new paper machine installations and outlays for woodyard improvements. Low energy prices have put power plant improvements on the back burner at many mills, and this is the only area where planned spending is not higher than last year.

Environmental spending is up 51% in the new survey to $680 million. Last year's survey saw the first increase in environmental spending plans since 1982, and this year's jump confirms the new importance of this area. Environmental outlays will almost certainly grow in coming years as mills formulate programs to eliminate dioxins from pulp mill effluent and to comply with new, more stringent air and water quality standards. In the current survey, environmental spending accounts for 5% of overall expenditures, well below the 1970s' level. Current plans focus on water-quality programs, which are up 105% to a total of $420 million for the 1988-90 period. Air-quality programs are pegged at $217 million, up 14% from last year, and solid-waste spending will decline 19% to $43 million after several years of sharp increases.

Pulp mill upgrades lead the way. Pulp mill spending shows the strongest growth for the second year in a row. Mills report plans to spend $4.6 billion on pulp mill expansion and modernization projects over the 1988-90 period. The pulp mill accounts for over 35% of total production spending this year, up from 24% last year and only 16% in 1986.

Activity is picking up strongly in the chemical pulping area after a hiatus of several years. High pulp prices and tight markets are an incentive to both producers and consumers, and the current crop of expansion projects is about evenly divided between the two groups. This upswing in expansion plans has been a recent phenomenon, with many of the largest projects gaining approval only within the last few months. Most of the increases will come in 1990 or later.

Expansion projects announced for completion in 1990 by Weyerhaeuser Paper Co. at Columbus, Miss.; Louisiana-Pacific Corp. at Samoa, Calif.; and Bowater Southern Paper Co. at Calhoun, Tenn., will add over 450,000 tpy to bleached kraft market pulp capacity. In 1991, Stone Container Corp.'s Port Wentworth, Ga., mill will start up a new 740-tpd bleached hardwood kraft market pulp mill as part of a $335-million modernization, and Union Camp Corp. will complete a 105,000-tpy market pulp facility in its $675-million expansion program at Eastover, S.C. A four-year, $408-million modernization at Champion International Corp.'s Courtland, Ala., mill, scheduled for completion in 1993, includes 250,000 tpy of new bleached kraft pulp.

These new projects join previously announced major expansions under way at Georgia-Pacific Corp.'s Port Hudson, La., mill; Nekoosa Papers Inc.'s Ashdown, Ark., facility; Federal Paper Board Co. Inc.'s Riegelwood, N.C., mill; and ITT Rayonier Inc.'s Jesup, Ga., plant. A $330-million expansion at Pope & Talbot Inc.'s Halsey, Ore., kraft market pulp facility appears likely to proceed for completion in 1991, and WTD Industries Inc. has plans to build a $420-million greenfield bleached kraft market pulp mill in Port Westward, Ore., by 1992.

Among integrated papermakers, the kraft paperboard sector is contributing the most to pulp expansion activity, both in plans to overhaul aging facilities to control odor and reduce costs and to provide furnish for new pa-

MAJOR MODERNIZATION/ EXPANSION PROJECTS IN U.S.

(over $100,000,000 at an existing mill site)

	1988-90+
Blandin Paper, Grand Rapids, Minn.	$344,000,000[1]
Boise Cascade, International Falls, Minn.	539,500,000[1]
Boise Cascade, Rumford, Maine	332,500,000
Bowater, Calhoun, Tenn.	205,000,000
Champion International, Bucksport, Maine	161,000,000[2]
Champion International, Canton, N.C.	200,000,000[2]
Champion International, Courtland, Ala.	408,000,000[2]
Champion International, Quinnesec, Mich.	360,000,000[1]
Chesapeake, Menasha, Wis.	148,900,000[1]
Consolidated Papers, Stevens Point, Wis.	111,200,000
Consolidated Papers, Wisconsin Rapids, Wis.	142,700,000
Federal Paper Board, Augusta, Ga.	460,000,000
Fort Howard, Rincon, Ga.	320,000,000[1]
Gaylord Container, Bogalusa, La.	100,000,000[1]
Georgia-Pacific, Zachary, La.	285,000,000[1]
International Paper, Texarkana, Texas	150,000,000[2]
James River, Clatskanie, Ore.	119,800,000[1]
Kimberly-Clark, Coosa Pines, Ala.	200,000,000[2]
Longview Fibre, Longview, Wash.	209,500,000[1]
Louisiana-Pacific, Samoa, Calif.	102,000,000
Midtec Paper, Kimberly, Wis.	260,000,000[1]
Pope & Talbot, Halsey, Ore.	407,053,000[2]
Potlatch, Cloquet, Minn.	109,000,000[1]
Scott Paper, Muskegon, Mich.	220,000,000
Scott Paper, Skowhegan, Maine	375,000,000[1]
Southeast Paper, Dublin, Ga.	300,000,000[1]
Stone Container, Port Wentworth, Ga.	341,782,000[2]
Temple-Inland, Rome, Ga.	185,000,000
Union Camp, Eastover, S.C.	675,000,000[1,2]
Union Camp, Montgomery, Ala.	188,000,000
Union Camp, Savannah, Ga.	375,000,000[1,2]
Westvaco, Luke, Md.	200,000,000
Westvaco, Wickliffe, Ky.	126,000,000
Weyerhaeuser Paper, Columbus, Miss.	500,000,000

1. Includes new paper machine.
2. Includes programs for completion in 1991 or later.

perboard capacity. Union Camp is the leader in this regard, with two projects under way to modernize pulp facilities in support of linerboard expansions at Montgomery, Ala., and Savannah, Ga. Major programs are also under way at Federal Paper Board's Augusta, Ga., bleached paperboard mill and at Temple-Inland Inc.'s Rome, Ga., linerboard facility.

Mechanical pulp mill spending will get a lift from the newsprint capacity expansion boom. Two mills, Newsprint South Inc. and Ponderay Newsprint Co., are scheduled for startup this year with new thermomechanical pulp facilities, and the new Alabama River Newsprint Co. mill is targeted for 1990. In addition, Blandin Paper Co.'s $344-million modernization at Grand Rapids, Minn., includes a new pressurized groundwood pulp system.

Machine rebuilds add capacity. Renewed activity in the paper machine rebuild area reflects the big pickup in capacity expansion plans. Mills report plans to spend $2.09 billion on paper machine modification projects in the 1988-90 period, up 39% from last year. Machine upgrades have had a major role in the industry's modernization efforts since the current economic expansion began in 1982, but most of the activity has been in cost cutting, product improvement, and grade realignment. New expansion plans based around rebuild projects have reversed this trend.

U.S. GREENFIELD MILL PROJECTS

UNDER CONSTRUCTION OR ANNOUNCED WITH STARTUP DATE

FSC Paper, Alsip, Ill. 80,000-tpy recycled tissue; Sulzer Escher Wyss paper machine	**1989**
Kimberly-Clark, Jenks, Okla. 68,000-tpy tissue; one paper machine	**1989**
Newsprint South, Grenada, Miss. 225,000-tpy TMP/newsprint; Beloit paper machine	**1989**
Ponderay Newsprint, Usk, Wash. 180,000-metric-tpy TMP/newsprint; Valmet paper machine	**1989**
Alabama River Newsprint, Claiborne, Ala. 220,000-metric-tpy TMP/newsprint; Valmet paper machine	**1990**
Mead, Phenix City, Ala. 366,000-tpy coated natural kraft paperboard; Valmet paper machine	**1990**
Mi Ho Paper, St. Joseph, Mo. Recycled coated and uncoated fine paper mill	**1990**
Willamette Industries, Bennetsville, S.C. 200,000-tpy uncoated free-sheet; Valmet paper machine	**1990**
WTD Industries, Port Westward, Ore. 300,000-tpy market bleached softwood kraft pulp	**1992**

PROPOSED (NO STARTUP DATE)

Kenaf International, McAllen, Texas
231,000-metric-tpy kenaf-based newsprint; active project
Kenaf of North America, Muskogee, Okla.
Proposed recycled linerboard mill; arranging financing
Northeast Paperboard, Northampton, Pa.
500- to 600-tpd recycled linerboard; preliminary study stage
Trans-Rim, Dunkirk, N.Y.
Proposed 200,000-tpy recycled containerboard mill
Westbrook Wood Products, Medford, Ore.
Proposed publication papers mill

Rebuilds will contribute the most to new capacity in the paperboard sector, where few new paper machines are currently scheduled. Kraft linerboard has been a focal point for incremental expansion activity recently, especially through installations of high-pressure presses, and this sort of project is spreading now to corrugating medium machines as well. Linerboard mills extensively rebuilding paperboard machines include Georgia-Pacific, Monticello, Miss.; Union Camp, Montgomery, Ala.; Temple-Inland, Rome, Ga., and Orange, Texas; Great Northern Nekoosa Corp., Cedar Springs, Ga.; and Stone Container's, Port Wentworth, Ga.

Among bleached paperboard mills, Federal Paper Board at Augusta, Ga., and International Paper Co. at Pine Bluff, Ark., and Texarkana, Texas, have major modernization and expansion programs under way.

Energy spending flat. Spending for power plant improvements in the U.S. industry has not kept pace with the explosion in overall capital spending plans recently. U.S. mills now report plans to spend $1.35 billion over the 1988-90 period on energy projects, the same amount reported a year ago for the 1987-89 period. Power plant spending comprises just 10% of currently planned outlays, down from a 17% share at the end of 1987. The drop-off in energy-related projects reflects a shift in emphasis from cost-containment projects in the late 1970s and early 1980s to capacity expansion projects in the late 1980s, as well as lower prices for oil and natural gas.

NEW MILLS AND MACHINES. New paper machines account for 29% of total production spending in this year's survey, up from 25% last year and only 12% the year before. Outlays for new machines total $3.72 billion, up 85% from a year ago.

The capacity expansion boom has led to an explosion of new paper machine announcements over the past year. Twenty new paper machines at existing mills and eight more at greenfield mills are due for startup during the 1988-91 period. That compares with only 17 new machine projects in last year's survey. The most active grades for new machines are tissue, coated and uncoated free-sheet paper, kraft paperboard, and newsprint.

No greenfield paper mills came online in 1988, but six new paper machines were started up at existing mill locations. Fort Howard Corp. added a second 250-tpd paper machine at its Rincon, Ga., recycled tissue mill, and a third unit is due online this year. Georgia-Pacific started up a new tissue machine in Palatka, Fla., early last year, and James River Corp. installed a new 70,000-tpy unit in Clatskanie, Ore.

Midtec Paper Corp. installed a new coated free-sheet machine in Kimberly, Wis., last year in a $260-million expansion project. The new unit replaced four older machines. Potlatch Corp. completed a similar, though smaller-scale, project in Cloquet, Minn., where a new coated free-sheet machine replaced three old uncoated units. In a $285-million program, Georgia-Pacific revamped the kraft pulp mill and installed a new 825-tpd uncoated free-sheet machine at its Zachary, La., mill.

1989 will mark the beginning of a major round of newsprint expansion that many fear will lead to overcapacity problems in the early 1990s. In the U.S., roughly 600,000 tpy of newsprint capacity will come online from three new paper machines. Newsprint South is building a $320-million facility in Grenada, Miss., Ponderay Newsprint will complete a $300-million facility in Usk, Wash., and Southeast Paper will bring online a new recycled newsprint machine in Dublin, Ga. Two new tissue mills are also scheduled for completion in 1989: Kimberly-Clark's $150-million facility in Jenks, Okla., and FSC Paper Co.'s $62-million mill under construction next to its existing recycled newsprint facility in Alsip, Ill. The other major installation scheduled is Blandin Paper's $344-million modernization and lightweight coated paper expansion in Grand Rapids, Minn.

Eleven new paper machines are scheduled to come online next year, seven at existing mills and four at greenfield facilities. Mead Corp. is building a new $556-million coated natural kraft paperboard mill in Phenix City, Ala. Gaylord Container Corp. will complete a new 1,000-tpd linerboard machine at Bogalusa, La., the first new linerboard unit to be built since 1985. Union Camp's $375-million modernization and expansion in Savannah, Ga., will replace two older units with a new kraft linerboard machine in 1991.

In uncoated free-sheet, Willamette Industries Inc. is building a greenfield mill at Bennetsville, S.C., for startup in 1990, and Boise Cascade has begun an extensive $525-million modernization and expansion program in International Falls, Minn. Union Camp will undertake a $700-million expansion that includes a new paper machine at its Eastover, S.C., mill. Champion International is installing a new coated free-sheet unit at its Quinnesec, Mich., market pulp mill, and Scott Paper Co.'s S.D. Warren Div. is building another lightweight coated free-sheet unit in Skowhegan, Maine. Alabama River Newsprint, a joint venture of Abitibi-Price Inc. and Parsons & Whittemore Inc., will bring online a newsprint mill in Claiborne, Ala., which is expected to cost $320 million.

Proposed machines close to approval? New mills and machines on the "proposed" list are something of a mixed bag this year. Several new machine projects appear close to approval, especially in the groundwood paper area. With so much capacity already in the pipeline, some of the proposed newsprint projects are likely to stay on hold for awhile, although at least one, Kenaf International, seems to be moving forward. Tissue is in a holding pattern similar to newsprint, with both Fort Howard and James River stretching out the time frame on further expansion projects into the mid-1990s. ■

NEW PAPER MACHINES IN U.S. AT EXISTING MILL SITES

STARTED UP IN 1988

Fort Howard, Rincon, Ga.
250-tpd, 270-in. Beloit twin wire—tissue
Georgia-Pacific, Palatka, Fla.
210-in.-trim No. 5 Beloit—tissue
Georgia-Pacific, Zachary, La.
825-tpd, 345-in.-trim Valmet twin-wire—uncoated free-sheet
James River, Clatskanie, Ore.
70,000-tpy, 276-in. Beloit—tissue
Midtec Paper, Kimberly, Wis.
205,000-tpy, 222-in.-trim Voith, replacing four—coated free-sheet

UNDER CONSTRUCTION OR ANNOUNCED WITH STARTUP DATE

Blandin Paper, Grand Rapids, Minn. **1989**
254,000-tpy, 306-in.-trim machine, replacing one—LWC
Fort Howard, Rincon, Ga. **1989**
250-tpd, 270-in. Beloit—tissue
Hollingsworth & Vose, Hawkinsville, Ga. **1989**
Specialty industrial paper machine—auto filter paper
Kimberly-Clark, Whiting, Wis. **1989**
30,000-tpy machine—premium correspondance and specialty papers
Southeast Paper Manufacturing, Dublin, Ga. **1989**
210,000-tpy, 330-in.-trim Valmet—newsprint
Boise Cascade, International Falls, Minn. **1990**
300,000-tpy, 348-in.-trim Valmet—uncoated free-sheet
Champion International, Quinnesec, Mich. **1990**
265,000-tpy, 280-in.-trim Beloit—coated free-sheet
Chesapeake, Menasha, Wis. **1990**
80,000-tpy Beloit twin-wire—recycled tissue
Consolidated Papers, Stevens Point, Wis. **1990**
59,000-tpy, 180-in. yankee fourdrinier—specialty coated
Gaylord Container, Bogalusa, La. **1990**
1,000-tpd machine—kraft linerboard
Longview Fibre, Longview, Wash. **1990**
240-in.-trim, 3,000-fpm Beloit—kraft paper
Scott Paper, Skowhegan, Maine **1990**
Lightweight coated free-sheet machine
Union Camp, Savannah, Ga. **1991**
460,000-tpy, 363-in. Valmet, replacing two-kraf
linerboard
Union Camp, Eastover, S.C. **1991**
240,000-tpy No. 2 machine—uncoated free-sheet

PROPOSED (NO STARTUP DATE)

Bear Island Paper, Ashland, Va.
Proposed 225,000-tpy newsprint machine
Blandin Paper, Grand Rapids, Minn.
Studying a second 220,000 tpy LWC paper machine
Daishowa America, Port Angeles, Wash.
Studying two machines, 220,000 tpy newsprint and 150,000 tpy directory
Federal Paper Board, Augusta, Ga.
Bleached kraft paperboard machine for phase three of expansion
Fort Howard, Rincon, Ga. and Muskogee, Okla.
Tissue machines under consideration for mid-1990s
Fraser Paper, Madawaska, Maine
Studying new lightweight coated paper machine
Great Northern Nekoosa, Ashdown, Ark.
210,000-tpy No. 64 machine—uncoated free-sheet
James River, St. Francisville, La.
Considering new coated printing paper machine
Jefferson Smurfit, Newberg, Ore.
275,000-tpy machine, replacing two—newsprint
Pentair, Duluth, Minn.
Studying second SC-A paper machine

CANADA

NEW MILL PROJECTS ABOUND; ENTREPRENEURS, FOREIGN INVESTORS LEAD EXPANSION DRIVE

■ Canadian capital spending is up 49% in this year's survey after a 48% rise last year. Companies report planned outlays of $9.92 billion for the 1988-90 period, compared with $6.67 billion for 1987-89. Capacity expansion is expected to boom, with the growth rate up 200% compared with the ten-year average. Growth will average 4.7%/year through 1990, compared with 1.6%/year from 1978-87, according to the Canadian Pulp & Paper Assn.'s latest survey of expansion plans. As in the U.S., strong demand, high prices, and record profits will fuel higher spending. Newsprint may be weakening, in part because of expectations of a capacity crunch over the next few years, but market pulp remains strong, and prices are high in both grades.

Environmental spending should also keep climbing over the next few years. The dioxin fight will be a costly one, estimated by PAPRICAN at almost $500 million—$10 million for each of Canada's 47 mills (these costs are not well represented in *P&P*'s survey since most companies have not yet announced specific spending programs targeting this problem).

Much more than in the U.S., capital spending is getting a boost in Canada from overseas investment, especially from Japan. Most recently, Crestbrook Forest Industries Inc., majority-owned by Honshu Paper Co. and Mitsubishi Corp. of Japan, announced plans to build the largest single-line pulp mill in the world in the Athabasca-Lac La Biche region of Alberta for startup in late 1991. The 496,000-metric-tpy facility, called Alberta-Pacific Forest Industries Inc., will produce bleached, mostly hardwood kraft market pulp and will be integrated with a paper machine by 1995. Cost of the project is $1.3 billion (the project was announced too late for inclusion in this article's spending tables).

Of eight other major expansion programs announced during the past twelve months, the four largest involve major investments by overseas papermakers. Daishowa Paper Manufacturing Co. Ltd. of Japan is building a greenfield market bleached kraft mill in Peace River, Alta., for startup in 1990. The $500-million mill will produce 340,000 tpy. In addition, Oji Paper Co. Ltd. of Japan has entered into a joint venture with Canfor Corp. to boost market pulp capacity 125,000 tpy by 1990 at the Howe Sound Pulp & Paper Co. Ltd. mill in Port Mellon, B.C. That project will cost $280 million. Howe Sound will then build a new 190,000-tpy newsprint mill in Port Mellon in a $355-million program targeted for completion in 1991. Fletcher Challenge Canada Ltd., majority-owned by New Zealand's Fletcher Challenge, plans to modernize the Crofton, B.C., mill in a two-phase program costing $238 million.

Entrepreneurial investment is also a major factor in Canadian spending plans. Led by Repap Enterprises Inc., which plans to spend over $500 million in the next few years, companies such as Cascades Inc. and St. Marys Paper Inc. that have rescued and rejuvenated old mills are responsible for a share of spending out of proportion to their size. Another group of entrepreneurs has come in from outside the industry and built new capacity, especially in the West. Fibreco Export Inc., British Columbia, and Millar Western Pulp, Alberta, exemplify this

CANADA—REPORTED CAPITAL EXPENDITURES FOR 1988-90+ BY REGION AND TYPE OF FACILITY (C$000)

PRODUCTION-RELATED EXPENDITURES

	WOOD/FIBER		PULPING		NEW MACHINES		REBUILDS		ENERGY		PLANT	
Maritimes	3,424	1%	283,252	7%	464,300	15%	110,000	12%	19,000	4%	6,060	2%
Quebec	56,929	22%	1,211,325	29%	1,280,000	41%	384,637	41%	142,696	28%	154,036	40%
Ontario	19,460	7%	348,955	8%	537,000	17%	177,700	19%	38,000	8%	113,000	29%
Central	7,230	3%	50,875	1%	250,000	8%	0	0%	8,288	2%	5,858	2%
West	176,168	67%	2,284,197	55%	604,216	19%	257,550	28%	297,845	59%	110,919	28%
Total	**263,211**	**100%**	**4,178,504**	**100%**	**3,135,516**	**100%**	**929,887**	**100%**	**505,829**	**100%**	**389,873**	**100%**

ENVIRONMENTAL QUALITY SPENDING

	WATER		AIR		SOLID WASTE		PRODUCTION		ENVIRONMENT[1]		TOTAL	
Maritimes	2,000	1%	0	0%	0	0%	886,036	9%	2,000	0%	888,036	9%
Quebec	57,220	22%	42,404	18%	6,906	25%	3,229,623	34%	118,530	22%	3,348,153	34%
Ontario	33,653	13%	1,383	1%	4,560	17%	1,234,115	13%	41,282	8%	1,275,397	13%
Central	4,680	2%	4,680	2%	390	1%	322,251	3%	9,750	2%	332,001	3%
West	158,269	62%	191,609	80%	15,625	57%	3,730,895	40%	372,418	68%	4,103,313	41%
Total	**255,822**		**240,076**		**27,481**		**9,402,920**		**543,980**		**9,346,900**	

[1] Includes unspecified spending not shown in subtotals.

Provinces are assigned to regions as follows: Maritimes: New Brunswick, Newfoundland, Nova Scotia; Central: Manitoba, Saskatchewan; West: British Columbia, Alberta.

group. Both brought new market bleached chemi-thermomechanical pulp (CTMP) mills online last year and are considering new investments to expand capacity.

Production-related spending of $9.40 billion is up 46% from last year's survey. Environmental spending plans for 1988-90 total $523 million, up 118% from last year. As in the U.S., the spending outlook appears strong well into the next decade. Projects for startup in 1988 account for $1.77 billion of the survey total, rising to $3.83 billion in 1989 and $3.19 billion in 1990. Reported costs for projects for startup beyond 1990 are $1.18 billion (not counting the Alberta-Pacific project).

Spending by category. In percentage terms, energy spending is up the most in this year's survey, rising 88% from last year. The most important categories are pulping projects and new paper machines. Spending for pulp projects has risen 70% this year on top of a 53% increase last year. New paper machines are up 43% this year, after a 107% rise in last year's survey. Spending will be relatively flat for paper machine rebuilds, as most capacity expansion programs are focused on new machines. Spending in this area totals $930 million for 1988-90, up just 4% from last year's survey.

Air-quality projects registered the highest growth in this year's survey of environmental spending. Outlays are pegged at $240 million, up 132% from last year. Water-quality programs total $256 million, up 122%, while spending for solid-waste disposal climbed to $27 million, an increase of 30%.

Mills now report plans to spend C$506 million over the 1988-90 period on energy-related projects, an 88% increase over last year. Most of that large increase can be attributed to the explosion in greenfield pulp and paper capacity approved since the beginning of the year. Twelve new mills are under construction or planned for startup in the 1988-91 period, compared with just three at this time last year.

Companies report plans to spend $4.18 billion on pulp mill projects during the 1988-90 period, an increase of 70% over plans reported last year. Pulping improvements account for 45% of total production-related spending, up from just 24% last year. Factoring in the new Alberta-Pacific project, pulp mill spending climbs another $1 billion, making the increase 111% over last year.

Capacity expansion plans. Canada's two major export grades, newsprint and bleached kraft market pulp, grew sluggishly at best for most of the 1980s. Now, however, growth in newsprint capacity will soar at the highest rate in several decades, CPPA reports. Bleached kraft market pulp will remain in the doldrums through the end of the decade, but expansion activity is picking up dramatically for the early 1990s.

In the paper and paperboard sector, growth will be fueled by continued strong activity in printing and writing paper as well as by the resurgence in expansion plans for newsprint. Producers report plans to add 1.23 million tpy of newsprint capacity by 1990, raising total capacity 12.4% to 11.15 million tpy. Printing and writing paper capacity will jump 40.3%, as mills add 1.11 million tpy to current capacity of 2.76 million tons.

Three new paper mills and six new paper machines at existing facilities are scheduled for startup this year. Three newsprint machines will come online with almost 600,000 tpy of capacity. Atlantic Packaging Products Ltd. is building a recycled mill with two machines to produce newsprint and tissue. Canadian Pacific Forest Products Ltd. will start up a new $323-million greenfield mill at Gold River, B.C. And Finlay Forest Industries Ltd. will integrate its market refiner mechanical pulp mill at Mackenzie, B.C., with a $165-million newsprint machine.

Also in 1989, Domtar Inc. will complete its four-year, billion-dollar modernization program in Windsor, Que., with the installation of a second new uncoated free-sheet machine. Another uncoated free-sheet unit will come online at Canadian Pacific's Dryden, Ont., mill. That project is budgeted at $175 million. Repap is installing a second coated paper machine for its New-

MAJOR MODERNIZATION/ EXPANSION PROJECTS IN CANADA

(over C$50,000,000 at an existing mill site)

	1988-90 +
Abitibi-Price, Chandler, Que.	C$113,000,000
Bowater, Brooklyn, N.S.	128,000,000
Canadian Pacific Forest, Dryden, Ont.	196,130,000[1]
Canadian Pacific Forest, La Tuque, Que.	62,000,000
Canadian Pacific Forest, Thunder Bay, Ont.	376,680,000[1]
Cariboo Pulp & Paper, Quesnel, B.C.	67,000,000
Cascades, Port Cartier, Que.	93,540,000
Consolidated-Bathurst, Bathurst, N.B.	94,300,000[1]
Consolidated-Bathurst, Grand'Mère, Que.	287,500,000[1]
Crestbrook Forest, Skookumchuck, B.C.	106,435,000[2]
Domtar, Windsor, Que.	428,000,000[1]
E.B. Eddy Forest Products, Espanola, Ont.	163,055,000[2]
E.B. Eddy Forest Products, Ottawa-Hull, Que.	97,705,000
Eurocan Pulp & Paper, Kitimat, B.C.	126,000,000
Finlay Forest Industries, Mackenzie, B.C.	198,000,000[1]
Fletcher Challenge Canada, Crofton, B.C.	275,000,000
Fletcher Challenge Canada, Elk Falls, B.C.	84,600,000
Howe Sound Pulp & Paper, Port Mellon, B.C.	260,000,000
Island Paper Mills, New Westminster, B.C.	82,000,000
James Maclaren Industries, Thurso, Que.	168,500,000
Kruger, Corner Brook, Nfld.	119,500,000
Kruger, Trois Rivières, Que.	400,000,000[1]
MacMillan Bloedel, Port Alberni, B.C.	145,600,000
MacMillan Bloedel, Powell River, B.C.	91,000,000
Quebec & Ontario Paper, Baie Comeau, Que.	287,600,000[2]
Quebec & Ontario Paper, Thorold, Ont.	188,400,000[2]
Quesnel River Pulp, Quesnel, B.C.	80,000,000
Reed, Quebec City, Que.	146,000,000
Repap Enterprises, Newcastle, N.B.	454,000,000[1]
Repap Enterprises, Prince Rupert, B.C.	60,000,000
St. Marys Paper, Sault Ste. Marie, Ont.	145,000,000[1]
Tembec, Temiscaming, Que.	331,056,000[1]
Weldwood of Canada, Hinton, Alta.	285,000,000
Weyerhaeuser Canada, Prince Albert, Sask.	262,000,000[1]

1. Includes new paper machine.
2. Includes programs for completion in 1990 and later.

castle, N.B., facility in a $370-million improvement program. Another integration project is under way at Tembec Inc.'s Temiscaming, Que., mill, where a new $265-million bleached paperboard machine will start up in 1989.

A second wave of newsprint capacity will hit in 1990, when Kruger Inc. in Trois Rivières, Que., and Canadian Pacific in Thunder Bay, Ont., will bring new machines online. Alberta Newsprint Co. Ltd., a new $360-million mill in Whitecourt, Alta., is also scheduled for startup in 1990. Kruger will offset its newsprint expansion by converting some capacity at Trois Rivières and Corner Brook, Nfld., to supercalendered papers. Improvements at both mills will cost $400 million. Also in 1990, Consolidated-Bathurst will complete a $280-million groundwood specialties machine installation at Grand'Mère, Que., replacing two old machines.

On the market pulp side, Canadian producers plan to double mechanical market pulp capacity by 1990, adding 597,000 tpy to the current total of 599,000 tons. Kraft market pulp capacity is expected to climb just 1.0% by 1990, or 67,000 tpy. Three market mechanical pulp mills are expected to be completed in 1990 and 1991. Nortek Forest Products has signed an agreement to build a new $60-million proprietary-process hardwood pulp mill in Meadow Lake, Sask., by late 1990. Donohue Inc. plans to build a $288-million CTMP facility in Matane, Que., for startup in 1990. Louisiana-Pacific Corp. will construct a new 155,000-tpy CTMP facility at Chetwynd, B.C., for completion in 1991. The $250-million program also includes two waferboard plants.

In the bleached kraft pulp sector, large-scale expansions are under way at Howe Sound Pulp & Paper, Port Mellon, B.C., and Weldwood, Hinton, Alta. Daishowa will build a 340,000-tpy mill in Peace River, Alta., for startup in 1991 at a cost of $500 million. Repap is considering a pulp expansion of about 90,000 tpy at an undecided location. ■

NEW PAPER MACHINES IN CANADA AT EXISTING MILL SITES

STARTED UP IN 1988

Consolidated-Bathurst, Bathurst, N.B.
150,000-tpy, 261-in.-trim Holder Pamac, replacing two—corrugating medium
St. Marys Paper, Sault Ste. Marie, Ont.
130,000-short-tpy, 184-in.-trim Tampella—SC groundwood
Weyerhaeuser Canada, Prince Albert, Sask.
220,000-tpy, 318-in.-trim Valmet—uncoated free-sheet

UNDER CONSTRUCTION OR ANNOUNCED WITH STARTUP DATE

Canadian Pacific Forest, Dryden, Ont. 175,000-tpy, 285-in.-trim Valmet—uncoated free-sheet	**1989**
Domtar, Windsor, Que. 175,000-tpy, 330-in. Beloit—uncoated free-sheet	**1989**
Finlay Forest Industries, Mackenzie, B.C. 600-tpd, 303-in.-trim Voith—newsprint	**1989**
Irving Pulp & Paper, St. John, N.B. 60,000-tpy, 206-in.-trim Valmet—tissue	**1989**
Repap Enterprises, Newcastle, N.B. 260,000-tpy, 300-in.-trim Voith—coated paper	**1989**
Tembec, Temiscaming, Que. 110,000-tpy, 177-in.-trim Tampella—bleached paperboard	**1989**
Canadian Pacific Forest, Thunder Bay, Ont. 240,000-tpy, replacing two—newsprint	**1990**
Consolidated-Bathurst, Grand'Mère, Que. 183,000-tpy machine, replacing two—groundwood specialties	**1990**
Kruger, Trois Rivières, Que. 180,000-metric-tpy, 300-in.-trim Beloit twin wire—newsprint	**1990**

PROPOSED (NO STARTUP DATE)

Cascades, Port Cartier, Que.
210,000-tpy SC paper machine under consideration
Stora Forest Industries, Port Hawkesbury, N.S.
225,000-tpy newsprint machine; project put on hold

CANADIAN GREENFIELD MILL PROJECTS
(metric tons)

STARTED UP IN 1988

Fibreco Export, Taylor, B.C.
180,000-tpy, two-line market bleached CTMP
Millar Western Pulp, Whitecourt, Alta.
210,000-tpy, two-line market bleached CTMP

UNDER CONSTRUCTION OR ANNOUNCED WITH STARTUP DATE

Atlantic Packaging Products, Whitby, Ont. Recycled 35,000-tpy tissue and 150,000-tpy newsprint; two Voith machines	**1989**
Canadian Pacific Forest, Gold River, B.C. 225,000-tpy CTMP/newsprint; Beloit paper machine	**1989**
Vicell Canada Tissue, Delta, B.C. 9,000-tpy dry form tissue	**1989**
Alberta Newsprint, Whitecourt, Alta. 220,000-tpy CTMP/newsprint	**1990**
Daishowa Paper, Peace River, Alta. 340,000-tpy bleached kraft market pulp	**1990**
Donohue, Matane, Que. 190,000-tpy bleached market CTMP	**1990**
Nortek Forest Products, Meadow Lake, Sask. 100,000-tpy Stake-process hardwood market pulp	**1990**
Alberta-Pacific Forest, Athabasca-Lac La Biche, Alta. 496,000 tpy bleached kraft paper, mostly hardwood	**1991**
Howe Sound Pulp & Paper, Port Mellon, B.C. 535-tpd TMP/newsprint	**1991**
Louisiana-Pacific, Chetwynd, B.C. 155,000-tpy bleached market CTMP	**1991**

PROPOSED (NO STARTUP DATE)

Alcan Aluminum, Vanderhoof, B.C.
Proposed newsprint or LWC paper mill
Fibreco Export, Taylor, B.C.
Studying a second 500-tpd bleached CTMP mill
Makin Pulp & Paper, Britannia Beach, B.C.
140,000-tpy CTMP/publication papers; awarded timber rights
Millar Western Pulp, Undecided location
Studying sites for second bleached market CTMP mill
Normick Perron/Forex, Val d'Or, Que.
225,000-tpy newsprint mill proposed
Repap Enterprises, Prince Rupert, B.C.
Considering new coated groundwood paper mill

PULP & PAPER

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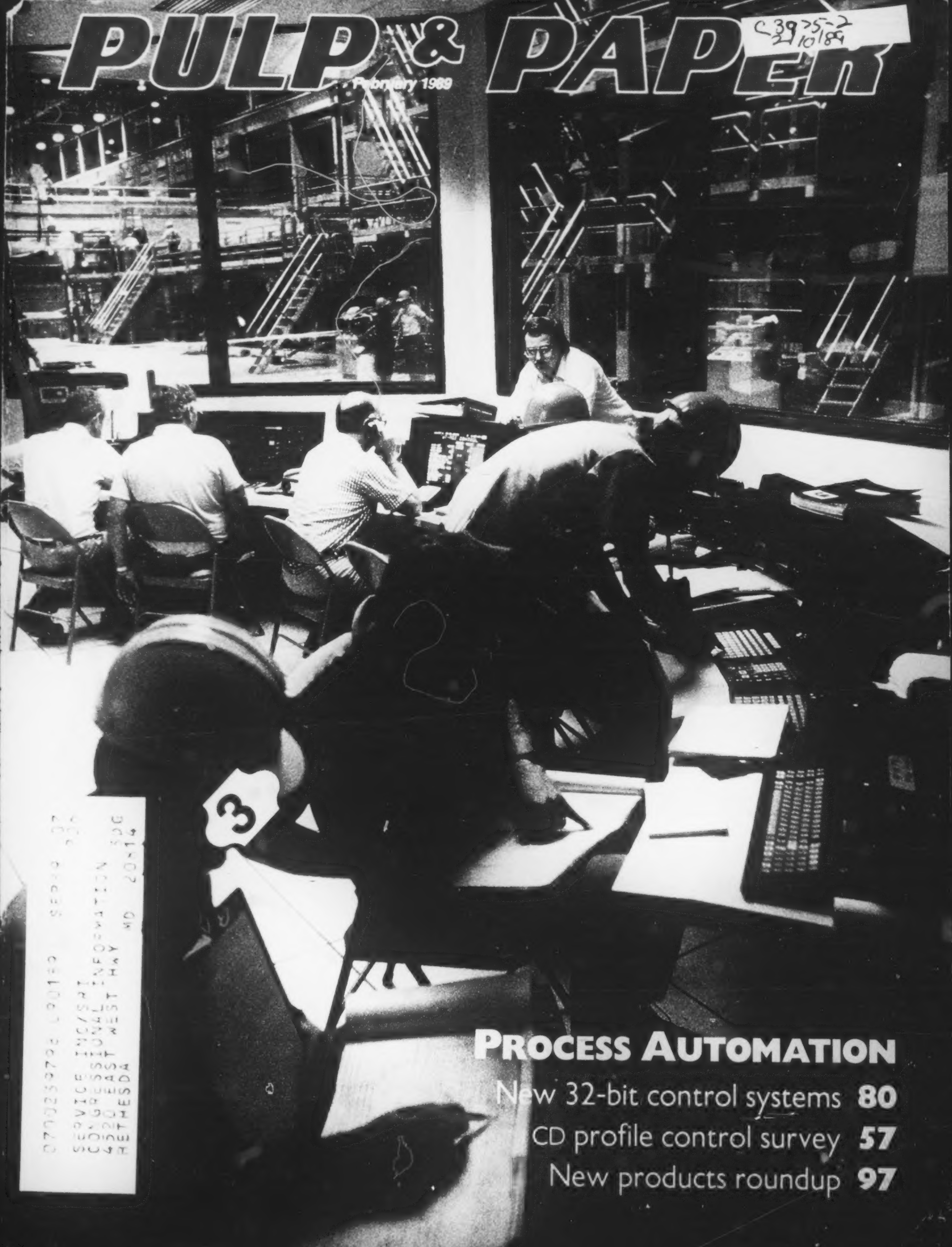

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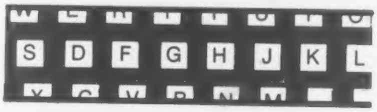

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James River, Sarrio form joint venture
Venezuelan group studying new mill

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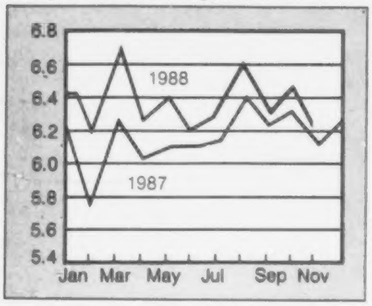
ABP

BPA

MONTH IN STATISTICS

U.S. paper and board production



U.S. production of paper and paperboard totaled 6.21 million tons in November, up 1.3% from a year earlier, according to the American Paper Institute. While the growth trend rate remains flat, both paper and paperboard will easily set new production records for the year. Total production for 1988 will be in the neighborhood of 76.8 to 77.0 million tons, API reports, up at least 3.2% from 1987.

Among major grades, printing and writing papers continued to perform strongly, with production up 5.6% through November. Groundwood paper production climbed thanks to heavy demand from commercial printers, while coated papers continued to benefit from robust demand among magazine and book publishers as well as commercial printers. Recycled grades posted the best performance in paperboard. Containerboard production for the domestic market was up 2.2% through November, and fiber box shipments set a new record for the month.

Canadian newsprint shipments totaled 845,000 metric tons in November, up 5.5% from the previous year. Newsprint mills operated at 98% of capacity for the month. Woodpulp shipments totaled 683,000 tons, up 0.1%, with mills operating at 97%. ■

		Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION [1]					
Newsprint	Nov.	493	2.3	5,968	2.4
Uncoated groundwood (s)	Nov.	131	17.0	1,611	7.5
Coated paper (s)	Nov.	611	4.1	7,411	8.3
Uncoated free sheet (s)	Nov.	914	0.8	11,334	3.7
Other printing/writing	Nov.	128	9.4	1,532	11.1
Total packaging and other paper (s)	Nov.	424	1.2	5,197	2.7
Tissue	Nov.	455	2.9	5,488	3.7
Total paper	**Nov.**	**3,157**	**3.0**	**38,541**	**4.4**
Unbleached kraft paperboard	Nov.	1,509	-1.2	19,236	2.2
Semichemical medium	Nov.	475	3.7	5,706	1.6
Bleached paperboard	Nov.	361	4.6	4,475	1.9
Recycled paperboard	Nov.	714	-3.4	8,844	3.7
Total paperboard	**Nov.**	**3,058**	**-0.4**	**38,261**	**2.3**
Total U.S. paper and paperboard output	**Nov.**	**6,214**	**1.3**	**76,802**	**3.4**
PULP, WASTEPAPER & FIBER [2]					
Total U.S. woodpulp production	Oct.	5,078	0.2	61,132	2.7
Market pulp production	Oct.	646	-3.6	8,409	4.2
Wastepaper consumption at paper/board mills	Oct.	1,565	-3.3	18,830	2.9
Pulpwood consumption (cords)	Oct.	7,908	-1.0	95,294	1.3
CONVERTED PRODUCTS STATISTICS [3]					
Corrugated box shipments (billion ft²)	Nov.	24.876	6.5	283.909[6]	3.4
Containerboard inventories at U.S. box plants and mills	Nov. 1	2,527	7.4		
INTERNATIONAL TRADE [2]					
U.S. paper imports (including products)	Oct.	1,044	-5.0	12,853	2.9
Imports of Canadian newsprint	Oct	680	-4.2	8,497[6]	-1.5
U.S. paper exports (including products)	Oct.	426	2.7	5,556	6.7
Exports of unbleached kraft linerboard	Oct.	143	-14.9	2,145	-3.9
Exports of woodpulp	Oct.	421	26.4	5,443	13.4
Norscan pulp inventories[4]	Nov. 30	836	-8.2		
Norscan pulp operating rates[4]	Nov.	99%	91%	94%	98%
CANADIAN STATISTICS [5] *(reported in metric tons)*					
Total newsprint shipments	Nov.	845	5.5	8,993[6]	1.2
Operating rates	Nov.	98%	99%	99%	98%
Inventories held by U.S. consumers	Nov. 30	1,431	-0.8		
Other paper/board shipments	Nov.	547	0.0	6,115	4.3
Woodpulp shipments (export only)	Nov.	683	0.1	7,379	1.0
Operating rates	Nov.	97%	98%	96%	96%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

Kraft linerboard: Market should be in balance—but no longer tight

Grade structure: Unbleached kraft linerboard is made in a wide range of basis weights. Standard weight in the U.S. is 42 lb/1,000 ft², but other important weights are 26 lb, 33 lb, 69 lb, and 90 lb/1,000 ft². Major end use is in domestic corrugated container production, although about 13% of output is exported. Specialty grades include mottled white, solid white, and wet strength-treated board. Recycled linerboard production has grown close to 500,000 tpy but is not included.

Production: The U.S. linerboard market began to ease in the second half of last year due to slower corrugated box cutup, sluggish linerboard export shipments, and a high underlying rate of industry capacity growth.

After rising 4.5% in first-half 1988, box shipments were up only 1.6% in the third quarter from a year ago. Shipments picked up slightly in the fourth quarter and were up about 2.8% for all of 1988. U.S. linerboard export shipments were relatively flat in 1988 at around 2.3 million tons. This mainly reflects a roughly 40% drop-off in shipments to People's Rep. China, a major customer that ordered heavily the previous year.

Signs of a supply imbalance became apparent in rising inventories at box plants and mills during the summer months. Some U.S. producers also tried to push tonnage in export markets using spot discounts, which resulted in an erosion in overall export price levels. Helped by maintenance downtime, inventories were reduced later in 1988, down to about the same level as at the start of the year. For all of 1988, U.S. linerboard production was up about 2.1% to just under 18.0 million tons.

Capacity trends: The high rate of industry capacity growth mainly has been due to incremental expansion projects, such as addition of high-pressure press sections. In addition, there probably was some shift of capacity from unbleached kraft paper to linerboard production.

The extent of the capacity "creep" was reflected in the recent American Paper Institute survey, which showed the industry capacity base had jumped 3.7% to 18.6 million tons in 1988. (This was 542,000 tons higher than reported in the previous year's survey for 1988.) The new API survey shows that capacity will rise by 2.5% to 19.08 million tons in 1989—but this has been adjusted upward in this forecast by 250,000 tons to reflect additional unreported capacity expansion.

Only two new linerboard machines have been announced: a 350,000-tpy machine at Gaylord Container Corp.'s Bogalusa, La., mill for startup in 1990 and another for Union Camp Corp.'s Savannah, Ga., mill, which will result in a 235,000-tpy net capacity increase after shutdown of an existing machine. In addition, Mead Corp.'s new 420,000-tpy clay-coated natural kraft board machine at Mahrt, Ala., may initially produce some linerboard following startup in 1991.

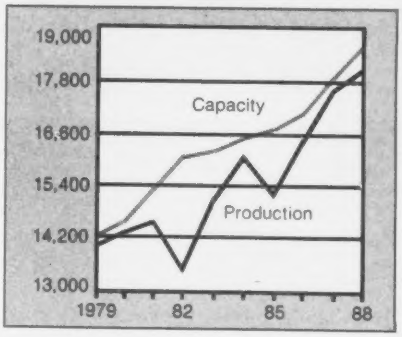
Future outlook: Corrugated box shipments are forecast to rise about 2.5% in 1989, based on about 2.8% growth in real GNP and 3.5% growth in industrial production. Linerboard export shipments are forecast to be up 4% to nearly 2.4 million tons, helped by continued weakness in the U.S. dollar and strong corrugated box cutup in Europe and the Far East.

Total production of linerboard is projected to rise 2.1% to 18.3 million tons. Based on the adjusted capacity base, this would result in an operating rate of 94.9% in 1989, down from 96.5% in 1988 but still a fairly well-balanced market.

Prices: The last $30/ton linerboard price increase to $410/ton took place in March 1988. Several producers have announced a $30 to $40/ton price increase for early 1989, but it is likely that the increase will not take hold until March or April. The increase probably marks the peak in the current market cycle and may not hold if the economy begins [illegible] weaken later in the year.

Historical year-end prices for 42-lb linerboard delivered in the eastern U.S. open market: 1988, $410; 1987, $380; 1986, $320; 1985, $250; 1984, $350. (For more detailed statistical information, see the *Pulp & Paper 1988 FactBook.*)

SUPPLY/DEMAND (000 tons)



FORECAST (000 tons)

	1987	1988	1989e
Production	17,682	17,965	18,340
Capacity	17,949[1]	18,613[1]	19,334[2]
Utilization rate	98.5	96.5	94.9
Imports	81	83	78
Exports	2,297	2,300	2,390
Apparent U.S. consumption	15,466	15,748	16,028
lb/capita	126.8	128.0	129.2
GNP ratio[3]	4.02	3.94	3.91

e = Estimate.

1. Based on 1988 American Pap[illegible] Institute capacity survey.
2. Revised upward by 250,000 tpy to reflect shift of capacity from kraft paper production. Adjustment also reflects capacity expansion beyond what was reported in the 1988 API survey.
3. 1,000 tons/billion $ real GNP.

TOP U.S. PRODUCERS (000 tpy)

	Annual capacity	Market share (%)
1. Stone Container[1]	2,535	13.5
2. International Paper	1,700	9.0
3. Weyerhaeuser	1,480	7.9
4. Union Camp	1,320	7.0
5. Georgia-Pacific	1,300	6.9
6. GN Nekoosa	1,220	6.5
7. Temple-Inland	1,195	6.3
8. Jefferson Smurfit[2]	860	4.6
9. Willamette	810	4.3
10. Pkg. Corp. Amer.	750	4.0

Market share of top five companies:
44.2%

Market share of top ten companies:
69.9%

Total U.S. capacity (1988 year-end):
18.842 million short tons

1. Includes 49% stake in Seminole Kraft Corp.
2. Includes 50% of Container Corp. of America.

MARKET PULP

Crestbrook to build 500,000-tpy pulp mill

Crestbrook Forest Industries Ltd. announced that it will build a 500,000-metric-tpy greenfield kraft pulp mill about 50 km northeast of Athabasca, Alta. The mill will produce about 80% bleached hardwood kraft pulp from aspen and 20% softwood pulp when it starts up in late 1991. The company plans to integrate the mill with a paper machine in the mid-1990s. The entire project is expected to cost C$1.3 billion. Crestbrook beat out Weyerhaeuser Co., which also wanted timber to construct a kraft pulp mill.

Crestbrook has formed a company, Alberta-Pacific Forest Industries Inc., to build and operate the mill, which has been awarded timber harvesting rights amounting to 3.2 million m³/year. Alberta-Pacific is a subsidiary of Crestbrook, which in turn is 64% jointly owned by Mitsubishi Corp. and Honshu Paper Co. of Japan, with the rest held by Canadian investors. This is the second major investment in Alberta by the Japanese (Daishowa Paper Manufacturing Co. is building a bleached kraft pulp mill near Peace River that is scheduled to start up in 1990).

The new mill will be the largest single-line pulp mill in the world, according to Crestbrook. Production will increase to more than 1,800 air-dry metric tons when the paper machine is fully operational. A spokesmanfor the company said that the paper mill will produce fine writing paper grades, including facsimile paper and computer printout paper. The paper mill is expected to start up in 1995 at the earliest.

The province of Alberta will contribute $75 million for infrastructure cost and a maximum debenture of $300 million to be repaid under a preset plan. Half of the $300 million will go to the pulp mill, and a maximum of $150 million will go to the paper mill. The cost of constructing a greenfield paper mill at the site is estimated at $300 million. About 200 direct jobs will be created when the paper mill starts up.

Alberta-Pacific must file an Environmental Impact Assessment. After this has been approved, construction can begin. The company anticipates that construction will start in spring of this year. According to new regulations promulgated in Alberta, the mill is required to install an oxygen delignification system and must also construct an onsite chlorine dioxide generator.

Alberta-Pacific and its woodlands will create 1,300 direct jobs and 2,600 indirect jobs. The company has chosen Stanley Associates Engineering Ltd., Alberta, to perform the engineering. H.A. Simons Ltd. performed the preliminary engineering. Alberta-Pacific's head office will be located in Edmonton, Alta.

Crestbrook runs a 175,000-metric-tpy bleached kraft market pulp mill in Skookumchuck, B.C., four sawmills in the province, and one plywood plant in Alberta. Currently, it exports 60% of its pulp and 90% of its lumber to the U.S., and it is expected that a lot of the output from the new paper mill will also be sold in the U.S.

Sawlogs harvested by Alberta-Pacific will be made available to local sawmills. The mill will buy woodchips from local operators and will also run its own woodyard.

Separately, a sawmill was awarded some cutting rights in the area. Northern Industries plans to construct a C$16-million specialty hardwood sawmill in Lac la Biche, Alta., with capacity for about 70 million bone-dry ft of hardwood lumber. The sawmill will probably supply Alberta-Pacific with aspen chips, and it could additionally supply Millar Western Pulp Ltd.'s bleached chemi-thermomechanical pulp mill at Whitecourt, Alta. The mill will employ a total of approximately 140 people when it starts up in December. Most of the lumber will be exported to Europe and Asia.

Public involvement is encouraged. Alberta is introducing a program that is aimed at keeping the public involved in the major forestry projects in the province. It is sponsoring a series of open houses that are designed to provide interest groups with an opportunity to voice their concerns about the projects to the government, the company, and the public. These open houses will be held in the local communities that will be affected by the expansions. Environmentalists are upset with Alberta-Pacific's plans to construct a bleached kraft pulp mill that will discharge into the Athabasca River, as do Procter & Gamble Cellulose Ltd.'s mill in Grande Prarie and Weldwood Ltd.'s mill in Hinton. ■

Major Alberta pulp and paper projects.

Company	Cost (C$ million)	Capacity (000 metric tpy)	Startup date
Alberta-Pacific, Athabasca	$1,300	496 BSK/BHK	Late 1991
Daishowa Canada, Peace River	500	340 BHK	1991
Weldwood of Canada, Hinton	393	214 BSK	Late 1989
Alberta Newsprint, Whitecourt	360	220 newsprint	1990
Millar Western Pulp, Whitecourt	205	210 BCTMP	Aug. 1988
Procter & Gamble, Grande Prairie	400	15[1] BSK	1991
		250[2] BSK/BHK	1992
Alberta Energy Ltd., Slave Lake	168	110 BCTMP	Late 1990

1. Incremental expansion.
2. P&G can expand second mill to 300,000 tpy.

Source: Alberta Forest Industry Development and *Pulp & Paper Week*.

BSK = Bleached softwood kraft. BHK = Bleached hardwood kraft pulp. BCTMP = Bleached chemi-thermomechanical pulp.

E.B. Eddy Forest Products to sell Eastern Fine Paper Div.

E.B. Eddy Forest Products Ltd., Ottawa, Ont., has signed a letter of intent to sell its Eastern Fine Paper Inc. Div. in Brewer, Maine, for an undisclosed amount. The intended purchaser is Preco Corp., Amherst, Mass., which owns Lincoln Pulp & Paper Co. Inc., an integrated pulp, paper, and tissue maker.

Eastern produces about 180 tpd of sulfite and cotton fiber printing/writing and uncoated and coated specialty paper. The Lincoln mill makes about 170 tpd of uncoated communication and printing paper and 100 tpd of toilet and facial tissue and napkin stock.

In a public statement, Preco president J.H. Torras said the two mills would retain their individual identities. Eastern president Bruce Hamilton and Lincoln president Robert Ackerman will remain at their posts.

Meanwhile, Eddy has indicated that it will not close down the remainder of its mill at Hull, Ont., if Scott Paper Ltd. acquires its White Swan Div. Eddy will retain ownership of all the land in the area and will continue to operate the 260-tpd fine paper operation at Hull, the lower mill steam plant, the filtration plant, and the clarifier. In a letter to employees, J.A. Pickard, E.B. Eddy senior vice president-paper manufacturing, said that the discussions with Scott are "at a preliminary stage and it will be some time before a final agreement is concluded." The White Swan Div. has capacity to produce about 220 tpd of tissue products. Scott said it does not plan to move Hull's tissue operations to another location if the acquisition is successful. ■

Hanson sells Allied Paper units, keeps Kalamazoo mill

Hanson plc will sell Allied Paper Inc. and its business forms operations to Allied Acquisition Inc., a newly formed company organized by a private investor group and certain Allied senior management, for $56 million.

Included in the sale are the SCM Allied/Ergy business forms converting plants and SCM Walton Printing. Hanson will retain control of the 425-tpd printing and specialty papers Allied Paper mill in Kalamazoo, Mich. and SCM Office Supplies and Histacount, another business forms unit. ■

CAPACITY EXPANSIONS

U.S. paper/paperboard capacity to rise

The U.S. paper industry will increase manufacturing capacity for primary paper and paperboard by 8.2 million short tons during 1989-91 for a 3.3% average annual gain, according to the American Paper Institute's 1988 annual capacity survey. During the same period, woodpulp capacity will increase by 5.1 million tons for an annual growth rate of 2.6%. These planned expansions will raise total paper and paperboard capacity to a potential 88.6 million tons by 1991 and industry pulp capacity to 67.8 million tons. Wastepaper consumption is projected to increase about 3.0% annually to reach 23 million tons by 1991, assuming that the industry continues to operate near full capacity.

For the second consecutive year, producers revised their expansion plans upward to reflect strong, sustained demand for the industry's products. For the period 1988-90, planned capacity additions increased by 18.0% since the 1987 survey. The 3.3%/year growth rate in paper/paperboard capacity over the next three years that was projected in the latest API survey compares with a 2.5%/year rate in last year's survey.

High industry profitability is fueling an unprecedented capital spending boom in both the U.S. and Canada, which will lead to the largest influx of new capacity in history. Fears that this North American expansion boom will coincide with an economic downturn and lead to overcapacity were downplayed by analysts, with the exception of market pulp and newsprint.

A looming oversupply of newsprint has already given newspaper publishers the leverage to delay the timing and amount of the next newsprint price increase. Some analysts also predict an oversupply of market pulp in 1991 or 1992 if all proposed worldwide pulp expansions are completed on schedule. Some 40 major market pulp projects with a combined total capacity of 8.0 million metric

Growth trends in U.S. capacity (000 short tons).

	Additions 1979–88		Additions 1989–91	
	10-year increase	Average annual growth	3-year increase	Average annual growth
Total all grades paper paperboard	**15,016**	**2.0%**	**8,266**	**3.2%**
Total paper and paperboard	17,223	2.4	8,249	3.3
Total paper	9,739	2.8	4,432	3.5
Newsprint	2,012	4.1	1,001	5.2
Printing/writing	7,498	4.0	2,823	3.9
Packaging and industrial converting	(752)	(1.3)	137	0.8
Tissue	982	1.9	470	2.7
Total paperboard	7,485	2.1	3,817	3.1
Unbleached kraft	5,120	3.0	2,423	3.9
Solid bleached	482	1.1	306	2.1
Semichemical	1,057	2.0	573	3.2
Recycled	826	0.9	515	1.8
Construction grades	(2,207)	(6.9)	17	0.3
Total all grades woodpulp	**10,864**	**1.9%**	**5,143**	**2.6%**
Total woodpulp[1]	11,888	2.1	5,078	2.6
Dissolving and special alpha	(172)	(1.2)	1	—
Sulfite	(506)	(2.7)	2	—
Sulfate and soda	10,528	2.5	3,885	2.6
Semichemical	202	0.4	298	2.0
Mechanical	1,835	3.4	893	4.4
Construction paper and board	(1,024)	(7.3)	65	2.3

1. Excluding pulp for construction paper and board.
2. Includes screenings. ( ) = Decline.
Source: American Paper Institute.

tons have been announced to date.

Pulp boom spurs expansion. High market pulp prices have prompted the wave of pulp expansions, either to increase capacity for internal use and reduce outside purchases or to provide tonnage to sell on the open market. Capacity for bleached and semibleached softwood grades will increase by 960,000 tons, while hardwood grades will increase by 1.36 million tons. Capacity for unbleached grades will increase by 1.6 million tons. Major expansion projects include new pulp mills by Bowater Southern Corp. at Calhoun, Tenn., and Weyerhaeuser Co. at Columbus, Miss. Over 100 expansion projects are scheduled.

Mechanical pulping capacity, including thermomechanical pulp and chemi-thermomechanical pulp, will increase by 1.191 million tons during 1989-91.

As part of the overall pulp expansion, capacity growth for U.S. market pulp will average 1.9% annually during 1989-91, after increasing 5.8% in 1987 and 4.4% in 1988. Market pulp capacity will increase by 525,000 over the next three years, raising industry capacity to 9.403 million tons in 1991.

Wastepaper consumption at U.S. mills is expected to reach about 23 million tons in 1991 if the industry operates at full capacity.

Newsprint oversupply. Most of the industry's major capacity expansions are scheduled to start up in 1990 and 1991, but new newsprint capacity will begin coming online in 1989-90, even as newspaper markets are weakening. Three new greenfield mills with total capacity of 665,000 tpy will be constructed. During the same period, Canadian producers plan to increase their newsprint capacity from 11.2 million tons in 1988 to 12.8 million tons in 1991 with the addition of six new machines.

Printing/writing more balanced. Among other paper grades, the printing/writing grades will add 2.823 million tons of capacity during 1989-91, averaging 3.9% annual growth. Uncoated free-sheet, the largest printing/writing category, will provide 1.283 million tons, or 45% of the total expansion.

Capacity for coated free-sheet, a much smaller grade category, will increase by nearly 1.0 million tons. Coated groundwood capacity will increase by 328,000 tons to 4.7 million tons by 1991. This 3.4% annual growth rate is more than double the historical 1.6% growth rate. The major project is a 220,000-tpy machine at Blandin Paper Co.'s Grand Rapids, Minn., mill. Uncoated groundwood paper, which includes supercalendered paper, will add only 179,000 tpy of capacity, well below its 6% annual rate of growth to date. Most of the capacity expansion is accounted for by Daishowa America Co.'s Port Angeles, Wash., mill.

Capacity for tissue paper will grow at a 2.7% average annual rate as a result of the installation of five new machines between 1989 and 1991.

Linerboard rebuild plans add up. Among the paperboard grades, unbleached kraft linerboard capacity will show the largest gain—3.9% annual growth—in 1989-91, increasing from 18.613 million tons in 1988 to 20.783 million tons in 1991. Only two new linerboard machines are planned.

- *Copies of the Capacity Survey are available for $300 each domestically and $325 overseas from the Capacity Dept., Box SM, American Paper Insitute, 260 Madison Ave., New York, N.Y. 10016.* ■

LABOR

Smurfit Newsprint locks out strikers

In January, Smurfit Newsprint Corp. locked out the 480 members of the Assn. of Western Pulp & Paper Workers who have been striking its Oregon City and Newberg, Ore., newsprint mills since last July. The union notified the company Jan. 3 that workers would return to work unconditionally. A Smurfit spokesman said that the company declined the offer, citing acts of sabotage and vandalism during the strike as well as the possibility of another strike if the workers returned to work without a contract. The spokesman said the company has hired temporary employees but legally cannot hire any permanent employees as long as the mill is in a lockout situation. A Dec. 28 meeting convened by the federal mediator ended without progress, and no further meetings have been scheduled. ■

IP's Texarkana mill signs new labor agreement

About 664 United Paperworkers International Union and International Brotherhood of Electrical Workers members signed agreements with International Paper Co.'s Texarkana, Texas, 1,300-tpd bleached board and market pulp mill. The UPIU contract calls for a lump-sum payment in the first year ranging from $500 to $1,100 and wage improvements of 2% in both the second and third year. In addition, shift production workers will receive a pay hike of 25¢/hour in the first year. The agreement with IBEW members calls for a lump-sum payment in the first year of $1,000 and a general wage increase of 2% in both the second and third years.

Meanwhile, members of the Assn. of Western Pulp & Paper Workers voted down a contract offer at IP's Gardiner, Ore., mill in December, and no further meetings are slated. The mill has been running under an implemented contract since January 1988.

- About 1,100 AWPPW members settled a new three-year contract with Scott Paper Co.'s Everett, Wash., mill. A company spokesman said the heart of the agreement is the inclusion of a clause establishing a cooperative effort between management and labor to address work rule flexibility changes.
- A new three-year contract has been settled by Container Corp. of America, Brewton, Ala., and about 495 UPIU, IBEW, International Assn. of Machinists & Aerospace Workers, and United Assn. of Journeys & Apprentices of Plumbers & Pipefitters union members. According to the agreement, workers will receive a lump-sum payment in the first year and general wage increases of 2.5% in the second year and 2% in the third. Premium pay for Sunday work was eliminated.
- Three international unions representing 13,000 Weyerhaeuser Co. workers have formed a joint council to develop contract negotiating strategies and strengthen their bargaining position. The council's first task will be to build and implement a plan to assist a UPIU local in Valliant, Okla., where workers are currently negotiating at Weyco's linerboard mill. The three unions making up the joint council are UPIU, the United Brotherhood of Carpenters, and the International Woodworkers of America. ■

SSL supply up, consumption steady; vanillin expansions on line

PRODUCTION. Sulfite pulping operations across North America are sharing in the good fortune of the pulp and paper industry. In 1988, overall production of sulfite pulp increased by 7% in the U.S. and remained flat in Canada. The capacity situation is similar, but there is some speculation about closure of some older mills in the Midwest and eastern Canada. This has been good news to the producers of sulfite byproducts, who are enjoying flat or steady growth in most business areas. Spent sulfite liquor (SSL), the chief raw material for most products, is in plentiful supply and at a fairly cheap cost to consumers.

The most significant sector of the sulfite byproduct market is in vanillin production. Closure of the world's largest vanillin facility, owned by Ontario Paper in Thorold, Que., and its subsequent dismantling left options open to the other major producers. The response came quickly, as both ITT Rayonier and Rhone-Poulenc announced and pursued expansion plans. Rayonier has doubled its existing facility in Hoquiam, Wash., bringing capacity to 1,500 metric tpy. The expertise of the company's research center and the available raw material from its pulp mills made the project viable.

Rhone-Poulenc is going ahead with a new plant to be constructed in Baton Rouge, La. at an approximate cost of $100 million. The plant will be sized to accommodate 2,000 tpy or more and will be operational sometime next year. Both expansions more than cover the gap created by Ontario Paper's closure.

In other business news, the Japanese papermaker Daishowa bought Reed Lignin and Reed Paper. No changes seem likely since the company receives its raw material from the mills in Canada.

The pulp and paper market's general strength has helped with the supply of raw materials. The overall increase in pulp production provides for softer pricing and greater availability and allows more scrutinized source selection. Ontario Paper's chemical plant closure decreased overall consumption of raw materials in 1988. Producers expect no real change in business conditions this year, with volume remaining flat and prices just as soft.

END-USER MARKETS. The vanillin market is growing a few percentage points per year in the food and fragrance sectors, but the real growth will appear offshore. But prices are firm and should stay that way until the new Rhone-Poulenc plant comes online. Imported material has not experienced much growth, hurt by a falling dollar and domestic production growth.

In the lignosulfonates market, the waters are a bit choppy. Oil drilling is still not back to where it was ten years ago in western Canada and the U.S. Southwest, but the price of crude is inching upward and there have been more meaningful meetings between OPEC members. Even the Texas Railroad Commission is participating in the process again after a two-decade hiatus. The construction market is steady, although compared with 1988, a few less homes and commercial buildings will be built. Creeping interest rates are the chief reason for that forecast.

The drought had a terrible effect on agribusiness in both the U.S. and Canada. Herds were slaughtered and crops were harvested before their expected times. As a result, the animal feed business suffered, but it should bounce back in 1989. The $130-million beef export market that has been threatened by the recent European ban will not significantly change the forecast picture.

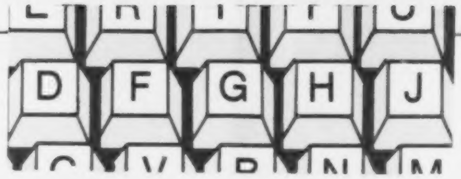
Other specialty areas have fared well. The markets for road clearance, chemical intermediaries and dispersants are all jockeying for position against other products but seem to be holding up.

Table 1: **Sulfite pulping production has not had a great affect on SSL consumption (bleached and unbleached, 000 tons).**

	1980	1985	1990	% annual growth
U.S. (short tons)	1,860	1,560	1,565	−2.7%
Canada (metric tons)	2,168	1,598	1,750	−1.9%

Table 2: **Outlook for major categories of SSL products.**

Lignosulfonates	Production	Consumption	Price
Commodity	Unchanged	Mixed	Mixed
Specialty	Increasing	Upward	Flat
Vanillin	Strong increase	Steady	Upward



SPECIAL REPORT: **PROCESS AUTOMATION**

SURVEY SHOWS MORE THAN 3,000 CROSS-DIRECTION CONTROLS NOW INSTALLED

Suppliers continue to offer new actuators and more sophisticated control software and integration with distributed control systems

By KENNETH E. SMITH, Executive Editor

Cross-direction (CD) paper machine control systems continue to be installed at a rapid pace by an industry striving to obtain higher quality in its products. A *Pulp & Paper* survey (*P&P*, Mar. 1987, p. 48.) showed that 1,847 CD actuators had been installed under closed-loop control through the end of 1986. A more recent survey found that number had increased by almost 67% to 3,079 by the end of 1988. Overall, the number of CD actuators under control in the industry has nearly tripled since *P&P*'s first CD survey at the end of 1984 (*P&P*, Feb. 1985, p. 72.), indicating their rapid acceptance.

Despite the strong growth in the number of new CD installations, the market seems far from saturated. The major players in the CD control market have introduced a number of new actuators, software systems, and sensors to enhance their product lines since the last survey. Two major control systems suppliers, Measurex and AccuRay, have complemented their lines of actuators. Two companies previously known primarily as actuator suppliers—Impact Systems and Devron-Hercules—now offer control software/architecture (and, in Impact's case, sensors as well). Measurex, AccuRay, Impact, and Devron-Hercules all now sell basis weight, moisture, and caliper actuators. In addition, all report CD coat weight and gloss/smoothness control abilities.

These companies have placed major emphasis on developing improved software to control the actuators, i.e., for decoupling adjacent control zones, "mapping" the sheet profile and correlating control of individual actuator control zones, and coordinating the actions of multiple actuators. Another major trend has been the attempt to move both machine-direction (MD) and CD controls away from dedicated systems and integrate them with the machine's distributed controls, i.e., the much-discussed "single window" concept. More powerful microprocessors have contributed to this trend, and "open" architecture has allowed personal computers to be interfaced with control systems for easier data access.

Moisture CD controls continue to be the most justifiable in terms of their improvement of productivity and beneficial effect on other CD variables. Some 566 of these actuators have been put under control in the last two years. The second most prevalent actuator installation is the oldest CD application, caliper, with 352 installations since the last survey. Basis weight, the most complex control, is third, at 314 in the past two years. Overall, moisture is the most common CD control, followed by caliper and basis weight; total installations are 1,303, 1,000, and 776, respectively. For this and the other surveys, only those actuators reported sold and installed with control software were counted to avoid duplication of installations, i.e., Measurex (or AccuRay) control of an Impact (or Devron-Hercules) moisture profiler reported as a system installed by both companies.

NEW GLOSS ACTUATOR. Measurex still leads the industry with a reported total of 1,276 actuators under control through the end of 1988, with 396 installations in the last two years. Measurex has introduced several new actuators, including the InfraTrol electric infrared moisture profiler. The InfraTrol design is said to use control widths as narrow as 1 in. Control zone widths are tailored to each machine and can be varied across the sheet on a given machine.

The GlossTrol drip-free gloss control actuator is designed to be installed on each side of a supercalender for control of top and wire-side CD gloss. New software allows independent control of gloss for both sides of the sheet. Gloss spread reductions of up to 80% in 2-sigma variation have been reported for a system that has been in operation less than one year.

Measurex has also introduced the Caltrol II with VariZone, an enhanced version of its Caltrol caliper actuator. Caltrol II uses higher-wattage heating elements and greater airflow than the Caltrol I. Caltrol VariZone I features dual nozzles to provide additional power in areas where greater control is required, such as sheet edges. VariZone II's variable nozzle spacing down to 1.5 in. allows the targeting of narrow streaks for higher-resolution profiling.

Measurex now markets the Eddy Current Automatic Moisture Profiler (ECAMP) for CD moisture control on yankee dryers. ECAMP, introduced by Beloit in the late 1970s, uses a series of staggered, low-current d.c. electromagnets mounted across the yankee dryer to selectively induce eddy currents in the dryer shell to generate localized heating for high-resolution moisture profiling.

Measurex will be introducing a number of CD control software enhancements in early 1989, including one package for "multiple-frequency actuator control." This software will optimize control of multiple actuators affecting the same sheet property but will act over different zones or in opposite modes (for example, a press-section steambox with 150-mm zones and a remoisturizing shower with 100-mm zones). Other packages include "enhanced profile computation" to reduce scan-induced CD and MD variance, "supercalender basesheet profile transfer" to provide feedforward information on the basesheet to the supercalender operator, and "enhanced caliper control," which is said to incorporate three separate software product developments. The multifrequency actuator control matches multiple-actuator capabilities (such as Caltrol and deformable rolls) with profile control requirements. The "heat transfer modeling" feature is said to provide inherent decoupling of adjacent control zones for faster, more stable control. And the AutoGain feature matches caliper control strategy to the unique conditions following a break or machine upset.

FIGURE 1: **Moisture actuators put under control by year.**

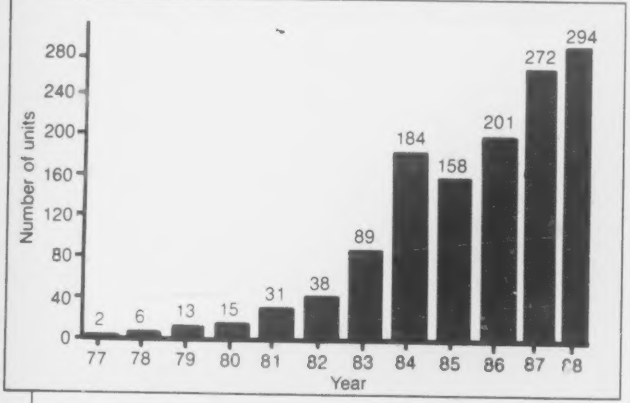
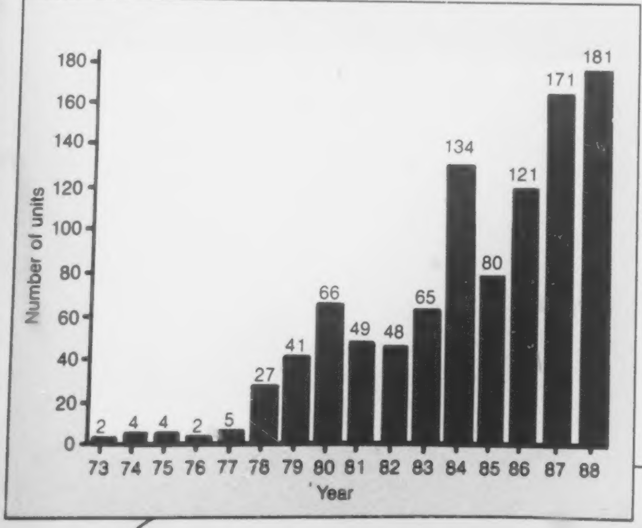


FIGURE 2: **Caliper actuators put under control by year.**



Measurex's version of profile-mapping software is its AutoLign Tracking program, which is said to precisely match profile measurement and control zones, regardless of web wander, control zone width, or nonlinear shrinkage of the web on the paper machine.

Measurex reports that no Measurex actuator is controlled by another vendor's software. It also says that 94% of its basis weight control systems use its Therma-Trol actuators, while 75% of its moisture profile controls and 48% of its caliper profiling systems use Measurex actuators. Measurex offers the single-window concept through integration of its paper machine MD and CD controls with its Vision 2002 distributed control system. A recent enhancement is the SuperVision system, which uses a 32-bit microprocessor (see related story, p. 80).

NEW MOISTURE PROFILERS. Combustion Engineering's Process Automation Business is second overall in total CD installations, with 890 of its AccuRay Profile Managers installed. AccuRay ran a strong second to Measurex the past two years. AccuRay first introduced its line of Microset actuators in 1986. Since then, the Microset Steam Profiler and Microset IR (infrared) Profiler, both for moisture control, have been added to the line. The IR profiler is electrically powered with a row of 5-in. heating modules, which are said to be able to control extremely small moisture variations. Up to four rows of heating modules can be mounted in a stainless steel, insulated drying hood. A recent installation reported an 83% reduction in the 2-sigma CD variation of a fine paper machine.

In 1988, the AccuRay 1180 MicroPlus single-window control system was introduced, and more than 30 systems have been sold. The 1180 MicroPlus is the integration of AccuRay measurement and actuation technology with MOD (formerly Taylor, now part of Combustion Engineering's Process Automation Business) distributed control systems. The 1180 MicroPlus features a universal gateway that enables communication with a variety of external control and process information equipment, including DEC VAX equipment and process level controls by Modicon and Allen-Bradley.

Enhanced signal processing capability is now offered with the 1180 MicroPlus as FirstSight measurement technology. This technology uses a 32-bit microprocessor. It reportedly allows a 960 data point, full-sheet profile, and 3,000 to 6,000 measurements per scan per sensor to create high-resolution sheet profiles with streak detection as narrow as 10 mm. The first 1180 MicroPlus system with FirstSight technology has been sold to Fraser Paper Ltd., Madawaska, Maine.

The AccuRay version of profile mapping software is its ProMap control strategy. ProMap is said to be an enhancement to the AccuRay Profile Manager weight control module that correlates profile measurements with the control zone of each slice actuator. This enables the module to compensate for sheet wander and linear, nonlinear, and asymmetrical sheet shrinkage.

The AccuRay MicroScan caliper sensor line has been enhanced to include the following: contacting caliper sensor, single air-bearing caliper sensor, and noncontacting caliper sensor. More than 550 AccuRay caliper sensors reportedly have been installed.

C-E's Process Automation Business "closed the loop" on control of supercalender CD caliper with deformable rolls at Haindl Papier GmbH and Consolidated Paper Co. Inc. in 1985. The company has more than 18 supercalenders under caliper control. AccuRay air-water spray actuators and infrared profilers have been applied to 12 coaters to date for CD moisture and coat weight control.

HIGH-SPEED WEIGHT CONTROL. Impact Systems began as a supplier of infrared moisture profilers and claims more than an 85% share of that market. The company reports 548 actuators sold (not necessarily under control) and now offers complete CD control packages. Impact says that 83% of its actuators are installed with its control systems and software. Impact has introduced the Dyna-Step weight profiling system that uses high-speed stepper motor actuators for closed-loop control of the headbox slice. The stepper motor reportedly makes 200 steps/sec. The system also features Simul-Step, which allows all the actuators to move in parallel, increasing the speed of response during grade changes and upsets. To date, 12 of these systems have been sold.

For caliper control, Impact offers the Super-Jet and Ultra-Jet variable temperature, high-velocity jet impingement actuators. They are part of the Therma-Jet series but feature a higher maximum power input (14-kW/CD ft and 20-kW/CD ft). Temperature control range of the Therma-Jet series is reportedly 30°F to 70°F. To date, 12 Super-Jet systems have been sold.

Impact's Series II is a second-generation software and control package. The system includes a high-speed local area network developed by Impact specifically for CD control. Special control features include profile-to-actuator mapping, decoupling, and multiple-width control zones. The Series II software reportedly supports up to 28 microprocessor-based nodes, which allow the customer to add actuators, sensors, and operator stations without software retrofits and added engineering costs. Series II also provides a bridge to distributed control systems for flexibility and expansion capacity. Forty Series II systems have been sold to date.

In 1988, Impact introduced the Spectrum-IR, a gas-fired infrared profiling system. It features a burner of proprietary material that reportedly allows cool-down in under 2 sec—as fast as Impact's electric infrared system. Twelve of these systems have been sold. Impact plans to introduce the Aqua-Pac remoisturizing spray system in early 1989.

Impact entered the sensor business with the introduction of the rapid-scanning (RS) caliper sensor. The scanner can operate at 1.3 ft/sec and uses an air bearing to prevent sheet scratching. Four have been sold. The sensor unit can also be piggybacked with existing scanners. Impact markets a complete line of scanning basis weight, moisture, gloss, ash, and direct coat weight sensors manufactured by its Finnish subsidiary, Impact Oy. More than 32 of these systems are installed in Europe. Impact also has a nonscanning moisture sensor—the RT.

FIGURE 3: **Basis weight actuators put under control by year.**

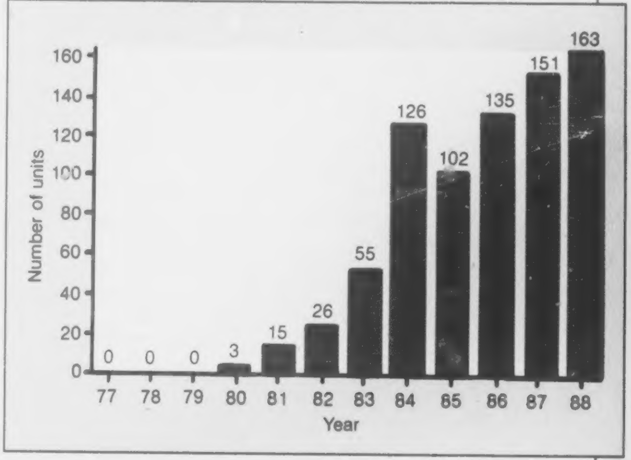
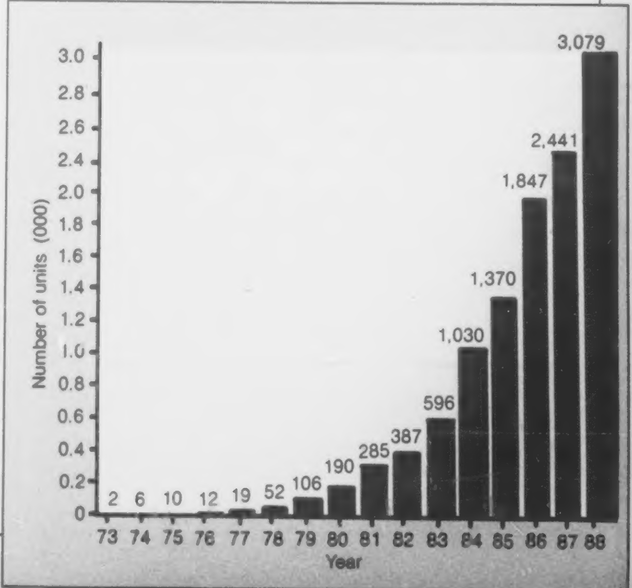


FIGURE 4: **Accumulation of all actuators under control.**



In 1988, Impact acquired Itronic Process AB in Sweden, which specializes in coating drying. Impact has both infrared profilers and Therma-Jet caliper actuators installed in coating applications for CD moisture and coat weight control. Results from using caliper actuators to change sheet smoothness at the calender stack (thus affecting coat weight pickup) based on measured bone-dry weight and coat weight profiles, have shown peak-to-peak profile variations reduced by more than 50%.

CLOSED-LOOP SOFTWARE OFFERED. Devron-Hercules continues as a very successful actuator supplier, with more than 1,000 sold by the end of 1988. The company introduced closed-loop software in 1987, and since then about 75% of its actuator installations (210 total in the past two years) have employed Devron-Hercules control software. The company has two new actuator offerings: the Calcoil II caliper control and the electric and gas Infradry moisture profiler. Calcoil II is said to have twice the power per heating zone of the original system, making it useful for supercalender caliper/gloss profile control. Thirty installations of Calcoil II and ten installations of Infradry are reported.

Devron-Hercules' latest closed-loop control system is based on its 386 ARCtech open system architecture using Intel 80386 microprocessor-based personal computers. All components are said to be standard and multi-sourced. Hardware, operating systems, communications networks, and programming languages are not proprietary. The HUMM (High-Speed Measurement Module) is offered to process signals directly from any existing scanner along a local area network to the Devron-Hercules control system. Advanced control algorithms such as mapping, filtering, and multiple-actuator control (MACtech) are also offered. To date, 70 closed-loop actuator control installations are reported. Devron-Hercules also reports that in 15 installations, it has integrated CD control into distributed control systems, including the Bailey Network 90, Foxboro I/A, Honeywell TDC 3000, and Fisher Provox.

Devron-Hercules reports 20 installations of the Calenderizer steam shower for control of gloss/smoothness and five installations of the Calcoil to control surface finish prior to coating operations.

Valmet Automation has integrated the CD control products of Sentrol and Wartsila into its offerings since 1987. The company reports a total of 171 CD actuators under control. CD weight installations include the Valmet Jetmatic and Sentry Optiprofile, both of which utilize algorithms developed by the Swedish Forest Research Institute (STFI) in Sweden. Valmet has acquired IRT, maker of an electric infrared profiler, and this equipment is offered by Valmet Automation. The company also reports ten supercalender CD control applications. It offers the QCS supercalender control system, which involves simultaneous control of moisture, caliper, and gloss profile.

V.I.B. Systems reports a total of 1,365 installations worldwide. V.I.B. has introduced a segmented profiling steambox, the System SC Turbo Steam Profiler. Through its three separate steam application zones, the Turbo Steam Profiler reportedly allows both moisture profiling and production increases.

Beloit has introduced its Profiling Air/Steam box with segmented compartments and double-acting valves to apply a mix of air and steam at each CD zone. It reportedly offers sharper profiling than other steamboxes.

Thermo Electron Web Systems reports 18 CD actuator installations in the past two years and a total of 186 overall. The company has aggressively pursued the application of its Steam Foil actuator to soft calenders, calenders, and supercalenders for gloss/smoothness and caliper control and reports ten installations. Approximately 10% of its installations are controlled by systems and software developed by the company.

THE FUTURE. The CD control market still seems far from saturated. One company estimates that currently less than one-half of the paper machines in the U.S. have CD controls installed and, on average, there are only 1.2 actuators per machine. Another supplier says that only 10% of all paper machines worldwide have total CD control (weight, moisture, and caliper), and only about 20% have either weight or caliper. About 30% of all machines are estimated to have CD moisture control. Another company estimates the potential for 70% of the world's paper machines to have four CD actuators and controls installed. In addition, the market for CD control in the converting area remains virtually untouched. Future actuator development efforts will focus on gloss, smoothness, and possibly formation.

The move away from dedicated control systems will continue with the integration of paper machine controls into the distributed systems. More powerful microprocessors will allow sophisticated algorithms to be implemented. More emphasis will be placed on improving overall sheet quality and coordinating the effect of multiple actuators rather than controlling individual loops.

Access to sensor signals by actuator suppliers could be a sore point as the "single source" and "open architecture" philosophies clash. As one actuator supplier says, "License fees, electronic gamesmanship, software mazes, and the threat of warranty cancellation are but some of the tactics that are used by gauging vendors to 'protect' profile information that the customer already owns. If the industry can open up the channels to this information, the profiling controls business will grow more rapidly, offering a wider variety of innovative products at more competitive prices." Another vendor offers a conflicting view, "An actuator by itself and of itself is no guarantee of performance. It takes the comprehensive integration of the actuator, the control software, and the operator interface to ensure that the perceived expectations are realized." ■

PULP & PAPER

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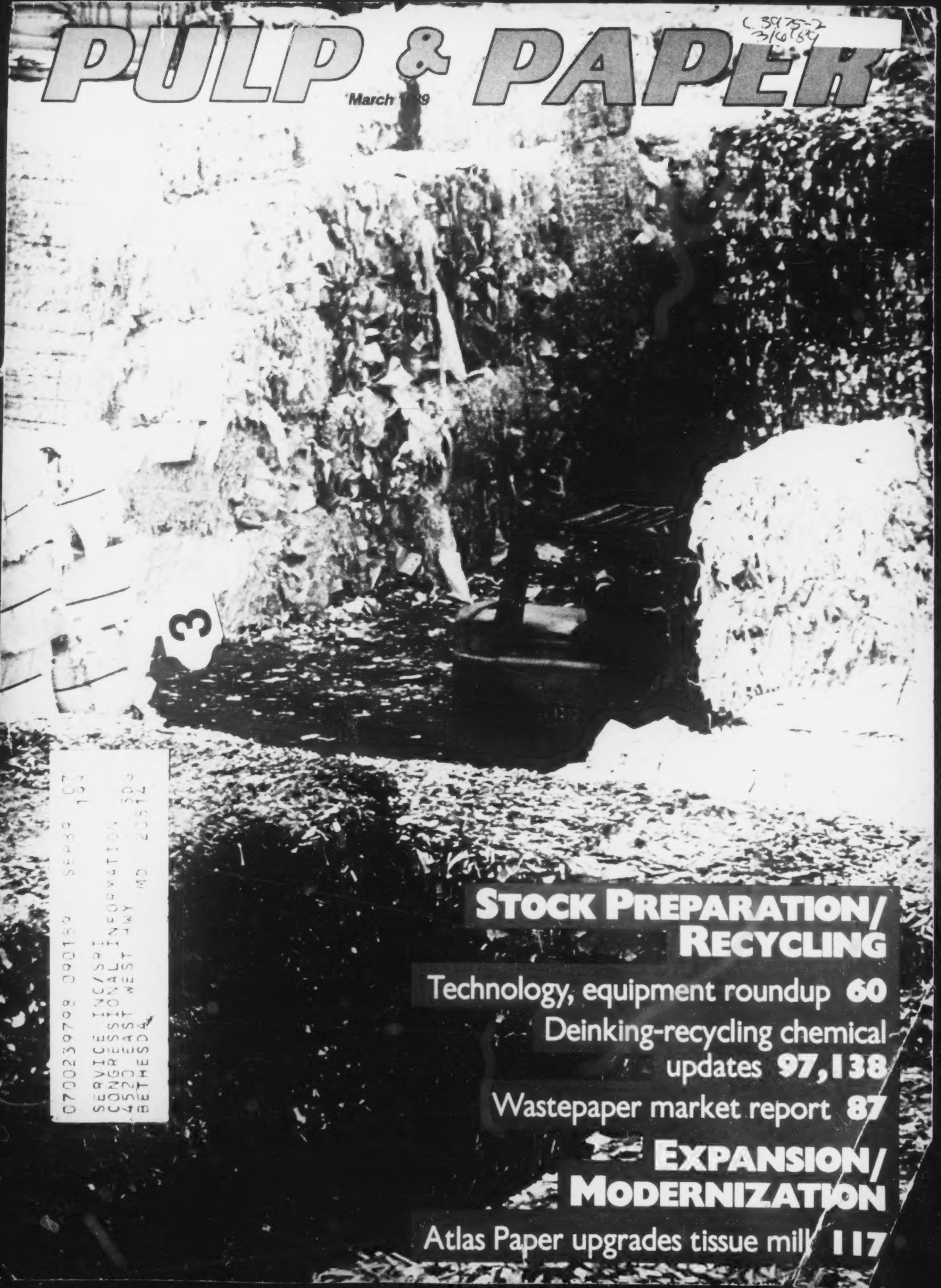

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This issue's focus on stock preparation and recycling is the first in a three-issue examination of papermaking. Forming will be covered in the April issue, and pressing and drying/coating will be covered in May. (Photo courtesy of Jefferson Smurfit Corp.)

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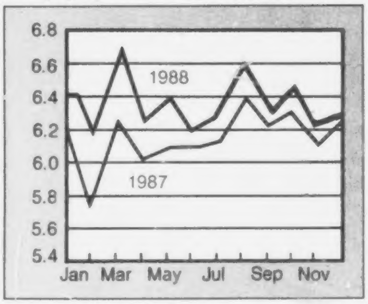
ABP

BPA

MONTH IN STATISTICS

U.S. paper and board production



U.S. production of paper and paperboard totaled 6.3 million tons in December, down 0.2% from December 1987, according to the American Paper Institute. The December decline caps a year of gradually declining growth in the trend of production. The 0.2% drop marks the first year-over-year decline since December 1985. Thanks to strength at the beginning of the year, however, total production finished the year at a record 76.7 million tons, up 3.1% from 1987. This new yearly record is the third in a row and the fifth in the past six years, API noted.

Among major grades, printing and writing paper production rose 5.2% to 21.9 million tons in 1988. Recycled grades were strongest in the paperboard sector, reflecting strong boxboard demand. Overall, boxboard production for domestic use rose 3.3% in 1988 to 6.2 million tons; containerboard production for U.S. consumption was up 2.2% to 23.5 million tons.

Canadian newsprint shipments totaled 874,000 metric tons in December, down 1.6% from the previous year. Production totaled 9.9 million tons for the year, a gain of 1.1% over 1987. Woodpulp exports rose 2.5% in December to 779,000 tons, bringing shipments for the year to 8.2 million tons, up 1.2%. ■

	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION [1]					
Newsprint	Dec.	512	2.6	5,982	2.4
Uncoated groundwood (s)	Dec.	122	9.9	1,598	7.6
Coated paper (s)	Dec.	583	-0.9	7,371	7.5
Uncoated free sheet (s)	Dec.	958	-0.1	11,356	3.5
Other printing/writing	Dec.	132	6.5	1,533	9.0
Total packaging and other paper (s)	Dec.	421	-2.5	5,198	2.5
Tissue	Dec.	450	0.2	5,480	3.4
Total paper	**Dec.**	**3,177**	**0.4**	**38,519**	**4.1**
Unbleached kraft paperboard	Dec.	1,636	-0.5	19,268	2.0
Semichemical medium	Dec.	478	6.5	5,708	1.9
Bleached paperboard	Dec.	381	-0.3	4,483	1.4
Recycled paperboard	Dec.	663	-6.6	8,771	3.1
Total paperboard	**Dec.**	**3,157**	**-0.8**	**38,230**	**2.1**
Total U.S. paper and paperboard output	**Dec.**	**6,334**	**-0.2**	**76,748**	**3.1**
PULP, WASTEPAPER & FIBER [2]					
Total U.S. woodpulp production	Nov.	4,967	3.2	60,994	2.8
Market pulp production	Nov.	684	2.1	8,391	4.0
Wastepaper consumption at paper/board mills	Nov.	1,569	1.0	18,930	3.2
Pulpwood consumption (cords)	Nov.	7,887	6.6	95,235	1.8
CONVERTED PRODUCTS STATISTICS [3]					
Corrugated box shipments (billion ft²)	Dec.	23.467	1.3	307.457[6]	3.2
Containerboard inventories at U.S. box plants and mills	Dec. 1	2,487	3.8		
INTERNATIONAL TRADE [2]					
U.S. paper imports (including products)	Nov.	1,048	-5.8	12,828	2.1
Imports of Canadian newsprint	Nov.	684	-6.0	8,471[6]	-1.9
U.S. paper exports (including products)	Nov.	440	10.6	5,531	7.0
Exports of unbleached kraft linerboard	Nov.	168	14.3	2,133	-2.6
Exports of woodpulp	Nov.	420	15.1	5,406	13.6
Norscan pulp inventories[4]	Dec. 31	666	-3.6		
Norscan pulp operating rates[4]	Nov.	97%	99%	91%	96%
CANADIAN STATISTICS [5] *(reported in metric tons)*					
Total newsprint shipments	Dec.	874	-1.6	9,867[6]	1.1
Operating rates	Dec.	98%	97%	99%	98%
Inventories held by U.S. consumers	Dec. 31	1,435	1.7		
Other paper/board shipments	Dec.	493	-5.4	6,620	3.7
Woodpulp shipments (export only)	Dec.	779	2.5	8,157	1.2
Operating rates	Dec.	88%	91%	95%	96%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

Coated free-sheet: Markets continue growth in high-end printing, publishing areas

Grade structure: Coated free-sheet contains 10% or less groundwood pulp, most commonly stone groundwood. The balance is chemical pulp. The highest-quality coated papers, Nos. 1 and 2, do not have any groundwood content, while Nos. 3 and 4 may or may not contain it. Slightly over half of all No. 4 paper is free-sheet.

Almost 86% of coated free-sheet paper is coated two side (C2S). Most of the 420,000-tpy of coated one-side (C1S) paper is free-sheet.

Basis weights for premium coated Nos. 1 and 2 are usually between 60 lb and 100 lb; Nos. 3 and 4 generally are 25 to 90 lb. About 40% of coated Nos. 3 and 4 fall below 60 lb.

Gloss is the most popular surface finish (85%), followed by dull, matte, and embossed. As measured on the Garner glossmeter, finishes are 45 or more for glossy, down to 25 for dull, and 20 or below for matte. No. 1 is 65% glossy and 25% dull, with a fraction matte and embossed; No. 2 is about 80% glossy and 16% dull; and No. 3 is 63% glossy, 33% matte, and 3% dull. Embossed represents less than 2% of any grade.

Approximately 85% to 90% of coated paper is shipped in rolls, but 10% to 15%, mostly higher-quality grades, is sheeted.

Production/capacity: Operating rates in 1988 were about 97%. U.S. coated free-sheet shipments rose to about 3.3 million tons, 8% above 1987.

Capacity increased about 7% in 1988. Additional tonnage was added by Midtec Paper Corp. in Kimberly, Wis., Westvaco Corp. in Luke, Md., and International Paper Co. in Corinth, N.Y. IP will add 100,000 tpy more at Corinth in 1989.

Canadian mills that make coated free-sheet include Abitibi-Price Inc. and Fraser Inc. Island Paper Mills Co., New Westminster, B.C., is planning to produce an unspecified amount of coated free-sheet with an off-machine coater by 1990, and Repap Enterprises Corp. Inc. will install a machine that can make either coated groundwood or free-sheet.

Outlook: Nos. 1, 2, and 3 grades will experience the strongest growth. No. 1, about 5.5% of the coated market, will continue to undergo excellent growth.

Producers such as Consolidated Papers Inc., Potlatch Corp., and Westvaco have introduced new premium or super-premium No. 1 grades that possess better reproduction qualities and higher prices than the established No. 1 papers. No. 2 grades are similar to No. 1 but with slightly lower quality and a wider basis-weight range. The grade will post some growth in "coffee table"-type magazines and books and especially in advertising brochures.

The largest market for coated No. 3 is for catalogs, which consume nearly 50% of all U.S. shipments, plus magazines, books, inserts, and direct mail. Growth is expected to be excellent. European producers have also become suppliers of Nos. 1 and 2 and the super-premium grades—about 8% of total demand.

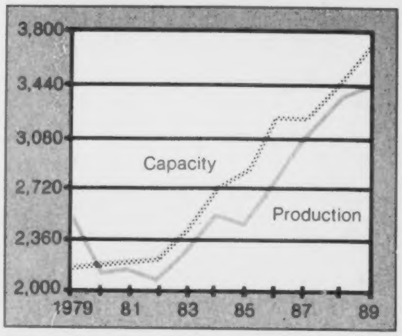
Shipments of coated No. 2 will increase, bringing its share of the coated market close to 5%. Growth for coated No. 3 will be 5.7% annually because it is produced mostly at integrated kraft mills, which have distinct cost advantages. For a minor price increase, end users can upgrade from No. 4, normally produced at mills that must purchase kraft pulp. In addition, the trend continues for No. 4 free-sheet demand to increase faster than No. 4 groundwood. C1S paper, primarily used for labels, is forecast to grow at only 0.7% annually.

Prices: Coated free-sheet prices rose in July 1988, and producers were expected to try another price hike by March or April 1989 due to a strong marketplace.

Typical historic pricing trends ($/short ton, average price for year) are as follows for 70-lb No. 1 sheets: 1984, $1,321; 1985, $1,375; 1986, $1,350; 1987, $1,410; 1988, 1509. For No. 3 rolls: 1984, $919; 1985, $980; 1986, $945; 1987, $980; 1988, $1,115.

Markets: Commercial printers use most of the coated free-sheet paper. Major end users are annual reports, catalogs, other advertising and promotional materials, some high-quality magazines, and some books.

SUPPLY/DEMAND *(000 tons)*



FORECAST *(000 tons)*

	1987	1988	1989e
Production[1]	3,085	3,338	3,435
Capacity[2]	3,229	3,456	3,731
Utilization rate	96.0	97.0	92.0
Imports	114	119	124
Exports	57	62	64
Apparent U.S. consumption	3,142	3,395	3,495
lb/capita	25.76	27.59	28.16
GNP ratio[3]	1.63	1.77	1.71

e = Estimate.
1. *P&P* estimate.
2. American Paper Institute.
3. 1,000 tons/billion $ real GNP.

TOP U.S. PRODUCERS *(000 tpy)*

	Annual capacity	Market share (%)
1. Scott[1]	900	24.1
2. Westvaco	530[2]	14.2
3. Mead	415	11.1
4. Potlatch	311	8.3
5. Simpson	290[2,3]	7.8
6. Champion	265[4]	7.1
7. Consolidated	255[2]	6.8
8. Midtec	200[5]	5.4
9. International Paper	175e	4.7
10. James River	148	4.0

Market share of top five companies:
65.6%

Market share of top ten companies:
93.5%

Total U.S. capacity (1989):
3.731 million short tons

1. S.D. Warren Div.
2. *P&P* estimate.
3. Includes Plainwell Paper Co. Inc.
4. 1988 production.
5. Division of Repap Enterprises Corp. Inc. Includes Canadian swing tonnage.

European beachhead. Consolidated-Bathurst's packaging operations in Europe would provide a good "beachhead" in that market at a time when the European Community is preparing for the elimination of tariff barriers among its members in 1992, noted Lynn. The company's Europa Carton subsidiary, based in Fed. Rep. Germany, has a recycled paperboard mill and about 11 corrugated box and folding carton plants. Consolidated-Bathurst also has tentative plans to build pulp and paper facilities in People's Rep. China, Argentina, and the U.S.S.R.

On the other hand, Consolidated-Bathurst would benefit from consolidating resources with a company that has traditionally been quick to raise funds and reinvest in its assets to improve its competitive position. A spokeswoman for the company said that it saw the acquisition as "friendly." Some observers wonder, though, if the corporate cultures will clash. Roger Stone said Canadian operations would continue to be based in Montreal, however, which should ease the transitional pangs. ■

SALES AND EARNINGS

U.S. pulp and paper industry profits sizzled during 1988

U.S. pulp and paper industry profits surged 42.8% last year on a 14.1% increase in sales, according to a *Pulp & Paper* survey of 26 companies. The high industry profits reflected strong demand that resulted in full capacity operation and price increases in most grade segments during 1988. The strong markets for pulp, paper, and paperboard helped to offset sliding demand and lower prices for wood products.

The surge in profits last year followed a jump in earnings of about 46% in 1987 and has been fueling a record boom in paper industry capital spending. Most chief executives were optimistic about prospects in 1989, with demand still strong and price increases already announced on some grades for the first quarter. Nevertheless, a few said they expected the rate of profit growth for their companies to slow in 1989.

International Paper Co. posted an 85% increase in earnings on a 21.8% increase in sales. Chairman and CEO John A. Georges attributes the strong showing to the company's white paper, market pulp, and packaging businesses. "For the second consecutive year, all our mills producing paper and paperboard operated at or near capacity," Georges said. He noted that IP is planning to invest more than $900 million this year to further modernize its facilities.

Champion International Corp. had an increase in profits of 19.4% to 456 million on sales of $5.1 billion thanks to improved results in domestic printing and writing paper, publication paper, market pulp, newsprint, and packaging. Income from operations in the company's wood products segment, which includes wood-related operations of Weldwood of Canada Ltd., fell due to a drop in prices for plywood and lumber. However, the effect of this decline was minimal since Champion restructured into primarily a pulp and paper company, according to chairman and CEO Andrew C. Sigler.

Great Northern Nekoosa Corp. enjoyed a 70.3% increase in earnings from 1987 on $3.6 billion in sales. "Excellent business conditions prevailed in our industry throughout the year," said GNN chairman William R. Laidig.

Paperboard profits surge. Profits of companies heavily involved in containerboard and bleached board increased dramatically. Union Camp Corp. reported that its net income for 1988 nearly doubled from the prior year, increasing 42.3% to $295 million. The company posted sales of $2.7 billion, an increase of 12.7% from 1987. Union Camp's paper mills operated at capacity throughout all of 1988, and chairman and CEO Gene Cartledge said, "This was an excellent year for each of our core businesses. Demand for paper and packaging products was strong, and selling prices improved significantly as the year progressed."

Jefferson Smurfit Corp.'s earnings surged 57.1% ahead of 1987's level to $145 million on sales of $1.3 billion. Strong performance by the company's 50%-owned Container Corp. of America affiliate helped to offset the strike at Smurfit Newsprint's two mills in Oregon, which started in early July last year. Equity in net income for CCA was $64.1 million in 1988 compared with $44.5 million the previous year.

Tissue profits strong. As tissue producers struggled with sharply rising fiber costs, James River Corp. led the first across-the-board tissue hike in seven years last spring. This hike helped the company boost earnings 22.7% on sales of $1.45 billion for the second quarter ended Oct. 31. And Kimberly-Clark Corp. enjoyed strong gains in sales and earnings, despite a year in which it was rumored to be the target of a takeover, causing stock prices to fluctuate. Still, Kimberly-Clark racked up $378.6 million in earnings—an increase of 16.4% over 1987.

Scott Paper Co. reported a 71.5% jump in earnings to $400 million, attributing part of the gain to the sale of Brunswick Pulp & Paper Co. and an after-tax gain from the company's share of earnings of international affiliates. Scott posted sales of $4.7 billion during 1988. Chairman and CEO Philip E. Lippincott said, "This represents the sixth year of continuous increases in primary earnings per share and the fifth consecutive year they have set all-time records."

Profits roll in white paper. Mead Corp. enjoyed an earnings improvement of 66.9% on sales of $4.5 billion, which chairman and CEO Burnell R. Roberts attributed to strong coated paper markets in all of 1988. "We operated at near-capacity levels, backlogs were sizable, and net selling prices improved across our grade lines," Roberts said. Boise Cascade Corp. registered a 58.0% increase in earnings to $289 million for the year on sales of $4.1 billion. John B. Fery, chairman and CEO, foresees that 1989 will be another excellent year for the company.

Bowater Inc. continued its sales and earnings records last year, rolling up a 102% increase in profits over 1987. Sales for the year increased 16.7% to $1.4 billion. "With stable operating costs, strong pricing for our pulp and paper grades, and a favorable dollar exchange rate to support our export trade, all our plans made since we became public in 1984 bore fruit," said Anthony P. Gammie, chairman and CEO. Newsprint sales and earnings set records for the year despite a softening in advertising. Demand for the company's lightweight coated paper and bleached kraft market pulp remained strong throughout the year, with Bowater's second coated paper unit at Catawba, S.C., exceeding its design production levels throughout the entire year, according to Gammie.

Decreased wood products income. Weyerhaeuser Co.'s earnings for the year amounted to $564 million, an increase of 26.4% from 1987, despite lower results in its forest products and building materials business segments. The company attributes the strong showing to a 41% increase in operating earnings of its pulp and paper operations. Weyerhaeuser is expecting that markets will continue to strengthen during this year, and the outlook is better for both the real estate and the financial services businesses.

The driving force behind Georgia-Pacific Corp.'s record-breaking profits was strong domestic and export markets for pulp and linerboard and good domestic demand for uncoated free-sheet paper, according to chairman and CEO T. Marshall Hahn Jr. Earnings for the year totaled $467 million, a 2% improvement over the 1987 level. Hahn said 1988 was a good year for the building products segment, even though income for that business was down from record levels in 1987. He is looking toward a strong showing in 1989, with new capacity resulting from the Brunswick Pulp & Paper mill that G-P acquired last August and expansions at several other G-P mills. ■

U.S. paper industry results.

	Full year ($000)			
Paper companies	**Sales 1988**	**% Change**	**Earnings 1988[1]**	**% Change**
Boise Cascade Corp.	$4,094,630	7.2%	$289,120	58.0%
Bowater Inc.	1,400,000	16.7	164,300	102.6
Champion International	5,100,000	10.9	456,000	19.4
Chesapeake Corp.	711,257	5.3	51,475	70.7
Consolidated Paper Corp.	896,804	20.7	149,883	56.5
Federal Paper Board Co.	1,116,941	8.9	143,300[2]	93.7
Gaylord Container Corp. (9/30)	671,000	53.2	41,900	117.1
Georgia-Pacific Corp.	9,509,000	10.5	467,900[2]	2.0
Great Northern Nekoosa Co.	3,588,100	38.6	341,700	70.3
International Paper Co.	9,500,000	21.8	754,000	85.3
Jefferson Smurfit Corp.	1,255,273	14.2	144,495	57.1
Kimberly-Clark Corp.	5,400,000	10.2	378,600	16.4
Louisiana-Pacific Corp.	1,799,400	8.8	135,200[2]	13.8
Mead Corp.	4,463,900	6.1	364,100[2]	66.9
Mosinee Paper Corp.	231,947	7.4	9,477	65.9
Pope & Talbot Inc.	514,980	20.9	31,944	13.6
Potlatch Corp.	1,084,000	9.3	112,400	28.3
Scott Paper Co.	4,726,400	14.7	400,900[2]	71.5
Sonoco Products Co.	1,599,751	21.9	96,277	56.6
Temple-Inland	1,750,000	9.4	195,000	37.9
Union Camp Corp.	2,660,918	12.7	295,146[2]	42.3
Westvaco Corp. (11/31)	2,133,889	12.1	200,434	37.1
Weyerhaeuser Co.	10,000,000	13.3	564,445[2]	26.4
Willamette Industries Inc.	1,716,021	19.9	161,087	32.8
Total	**$75,924,211**	**14.1%**	**$5,948,183**	**42.8%**

1. Income after taxes, from continuing operations, excluding most significant nonrecurring items in both years.
2. **Federal Paper**: Fourth-quarter and year earnings include one-time pretax gain of $7.2 million from a prior-year tax settlement and the net effect of a facilities restructuring program. **Georgia-Pacific:** Net earnings include a pretax gain of $66 million from liquidation of investments. **Louisiana-Pacific:** Restated from both years to reflect spinoff of Fibreboard in June 1988. **Mead:** 1988 Earnings reflect a loss of $11.4 million from discontinued operations. In the year-ago quarter, data reflects an extraordinary loss of $1.5 million. **Scott Paper:** Fourth quarter includes an after-tax gain from the company's share of earnings of International Equity Affiliates. 1987 net includes a $21.1-million after-tax gain from International Equity Affiliates and an $11-million one-time gain from a debt recapitalization program in Mexico. 1988 includes a pretax gain of $207.3 million from sale of Brunswick Pulp & Paper. **Union Camp:** 1987 results restated to reflect the consolidation of subsidiaries involved in real estate. **Weyerhaeuser:** Fourth-quarter and year results reflect consolidation costs.

EXPANSION/MODERNIZATION

Westbrook selects site for publication paper mill

Westbrook Wood Products has announced the selection of Klamath Falls, Ore., as the future site of a $300-million greenfield mill that will probably make newsprint or lightweight coated (LWC) paper. While still negotiating with potential partners, the company is going ahead with the permitting process and expects to have more details on the project in a few months.

In the meantime, Westbrook expects to reach a partnership agreement with at least one of the three paper companies it has been talking with in recent months and could possibly form a consortium with more than one other investor, it was noted. Two of the three potential investors reportedly are based offshore. Westbrook, a California-based firm involved in lumber, woodchips, and other ventures, has been considering the mill project since late 1987.

At first, a newsprint/thermomechanical pulp mill was proposed. Later, with planned newsprint capacity additions accumulating to over 2 million metric tons by 1991, the company decided to consider LWC paper. The mill is expected to employ about 300 people.

Klamath Falls, located at the headwaters of the Klamath River in south central Oregon, was chosen for several reasons, noted Burton Weast, president of Western Advocates Inc., an Oregon firm that represents Westbrook's interests. A regional wastewater treatment facility to be built at the mill would replace two nearby plants to solve local environmental concerns. This should expedite the permitting process, with both community and government authorities supporting the project.

Being in an enterprise zone, the mill will also qualify for property tax advantages that are expected to save about $8 million in the first five years of operation. The mill site is surrounded by large stands of available pulpwood (white fir, lodgepole, and ponderosa pine), and chip sources available within a 100-mile radius could supply the mill "several times over," the spokesman said. Other sites in Medford, Ore., and Montague, Calif., had also been considered during the one-year selection process. ■

Wastepaper use influencing pulp, paper chemical consumption

PULPING. Collection of wastepaper has been rising over the past decade, achieving a level above 25 million tons in 1988. The wastepaper utilization rate increased again to 27%. Old corrugated containers (OCC) leads in collection and utilization, but there is steady growth in newspaper and mixed and lagging growth in pulp substitutes and deinking stocks. Pricing for many grades is firm and exports are up. Many expansion plans for board mills and others are including secondary fiber systems.

Chemical suppliers have had a keen interest in these developments and have responded in kind to growing customer needs. On the pulping side, industry sources confirmed the renewed interest of the flotation and flotation/washing systems. Berol Chemicals, a pioneer in supplying a displector series to these systems, is seeing interest in its successful Berocell 204 product, a single formulation for combination systems—proven in systems accepting laser-ink-containing paper. Drew, also bullish in this market, is introducing two new deinking dispersants (Drewsperse 170 and 190).

Formulators are experiencing upward consumption trends and expect growth through industry production gains and increased concern on repulped fiber heading toward the paper machines. Berol said that they are working on an antiredeposition aid to boost brightness. Prices for products are not expected to shift appreciably in either direction, but most suppliers are tied to commodity chemicals that have had a recent history of fluctuation. One supplier also mentioned the tremendous interest in the southern and western markets.

The commodity side looks stable and is benefiting from industry growth. Silicate suppliers agree that overall levels are not as high as in the past, but good signs are all around. In recycling processes, smaller producers had used metasilicate but have switched to a liquid silicate product. The product is environmentally sound. Customers are establishing delivery requirements, particularly those in colder regions. For suppliers, markets in mechanical pulping look very bright. Prices for silicate products rose in fall 1988, an adjustment attributed to production costs such as formulators (silicate manufacturers also rely on alkali sources).

PAPERMAKING. The systems producing secondary fiber have created new productivity and runability concerns for papermakers. Although the mechanical end of deinking is sound and a portion of the latest purchased systems have included extra banks of cleaners, some carryover of contaminants is evident in forming and especially drying. Most of our respondents talked about the soaring interest in automatic and continuous washing systems for felts and wires, dispersants for stickies, microbial control, and other aids to control contaminants.

Suppliers are introducing products to help combat these problem furnish components. Betz Laboratories has seen wastepaper source changes affect stickies volume and control. The rising cost of high-quality secondary fiber is causing some mills, for example, to substitute OCC for preconsumer double-lined kraft (DLK). The challenge in making this switch is managing the hotmelt content in the OCC. Additives are available to do this.

PRODUCT OUTLOOK. In 1989, Betz plans on introducing a second-generation stickies detackification product for better control at lower treatment costs. Betz is also responding to source changes involving printed waste substitution of unprinted waste. This pulper deinking technique will be supported by a deinking agent that does not adversely affect sizing.

Drew is planning new products for felt washing (Drewclean 290) and microbiocides (Amerstat 445) as well as a new line of lower-cost/higher-activity defoamers. Buckman Laboratories is introducing Busperse 294 for controlling stickies and other pitch fixatives. Calgon mentioned that it is looking into new products to complement its formation and retention/drainage lines and has seen particular interest from linerboard producers. E.F. Houghton is also looking into expansions within its product lines.

No price activity is scheduled and availability is market. Sales are growing rapidly for suppliers who responded. Inquiries to various paper mills that use secondary fiber confirmed that these cleaners and conditioners are helping to extend production schedules and to hedge engineering shortfalls on the machines (such as felt storage and use, unfelted dryer sections, etc.).

On the business end, Berol is now operating under the Nobel Industries Paper Chemicals banner. No changes in products or services are foreseen. Calgon is expanding its geographical coverage of the paper industry, which will encompass all manufacturing points in North America.

—Michael Ducey

Wastepaper's popularity is growing in the U.S. (million tons).

	1980	1985	1988
Collection	17.9	19.6	25.2
Exports	2.66	3.28	4.80
Deinking	1.14	1.38	1.80
Utilization rate	23.8%	24.0%	25.0%
Furnish fraction	22.8%	23.6%	25.1%

Source: *Pulp & Paper Factbook.*

THE ECONOMICS ARE RIGHT FOR U.S. MILLS TO RECYCLE OLD NEWSPAPERS

More states are enacting mandatory collection and procurement laws to ease landfill crises, but they are ignoring market forces

By FRED D. IANNAZZI

Of the total U.S. solid-waste stream of 145 million metric tpy, paper and paperboard products comprise 64 million tons, or 40% of the total. By far, the two largest components of paper and board waste are old corrugated containers (OCC) and old newspapers (ONP). OCC, which is used to make the corrugating medium layer of corrugated containers, is actually in short supply. The recovery of OCC has risen from 44% to 50% over the past five years and is projected to rise even further in the next few years. Market forces alone will ensure that OCC will become a lessening burden in the waste stream.

ONP, however, is a different story. Only 32% of ONP is reused. That percentage has remained essentially unchanged for the past five years and shows no sign of increasing. Unrecovered ONP alone accounts for 15% of the paper and paperboard waste, or 6% of total U.S. solid waste. Since the recovery of ONP is not increasing as a result of market forces and since ONP is relatively easy to segregate at source (not in a mixed-solid-waste stream), many states and municipalities are enacting legislation that encourages or mandates greater recycling and reuse of ONP.

ONP GENERATION AND REUSE. The U.S. is by far the largest single consumer of newsprint, accounting for almost 41% of world consumption—about four times the usage of Japan, which is the second largest consumer. The U.S. is the only country in the world whose consumption of newsprint greatly exceeds its production. Only about 42% of the U.S. requirement is produced domestically.

Obviously, the U.S., as the world's largest consumer of newsprint, is also by far the largest generator of ONP and the largest potential market for ONP. The problem of ONP in the solid-waste stream on the scale encountered in the U.S. is unique to the U.S. Because of this vast tonnage, other countries' experiences in ONP recovery cannot necessarily serve as a model for the U.S.

Figure 1 shows the overall supply and disposition balance for newsprint in the U.S. in 1987. Starting in the center of the chart, we see that total U.S. consumption of newsprint was 12.3 million metric tons. Only 32% of this newsprint was recovered, and the remainder—about 8.4 million metric tons—ended up in the solid-waste stream.

The three markets for recovered ONP are newsprint manufacture, fiber furnish for other paper and board products, and export. We can assume that essentially all the export ONP is used to make newsprint, and, therefore, about half of the recovered ONP is recycled to newsprint.

There is little opportunity for increasing the reuse of ONP for nonnewsprint paper and board products; an ample supply of other grades of wastepaper better satisfies these applications. To increase the reuse of ONP significantly, we should encourage its increased use by newsprint mills in the U.S., keeping a few things in mind:

1. Only 24% of the fiber used in newsprint manufacture in the U.S. is recycled, and 76% is virgin fiber.

2. U.S. mills produce more than three times as much newsprint from virgin fiber as from ONP.

3. Fully 58% of total U.S. newsprint requirement is imported (almost all from Canada), despite the fact that a valuable low-cost resource—ONP—is burdening the U.S. with waste disposal problems and costs.

BARRIERS TO REUSE OF ONP. The supply of ONP is not a barrier to increased use. Existing supply channels could easily collect far more ONP than is presently collected if a viable market for it exists. In market terms, the volume of ONP recovered and recycled is *demand* limited, not *supply* limited. Legislation that mandates increased collection of ONP merely increases the supply; it does nothing to increase the demand. Unless demand is increased, any supply of segregated ONP will inevitably end up exactly where the unsegregated ONP does now—in landfills or incinerators.

Mr. Iannazzi is president, Andover International Associates, Danvers, Mass. This article is based upon information contained in a multi-client study published by AIA. All tons in this article are metric.

COMPARATIVE COSTS: ONP VS PULP. If it can be demonstrated that newsprint manufacture from ONP is economically attractive compared with virgin fiber and if the newsprint mills install the capacity to increase the demand for ONP, the supply of ONP could easily be increased 50%.

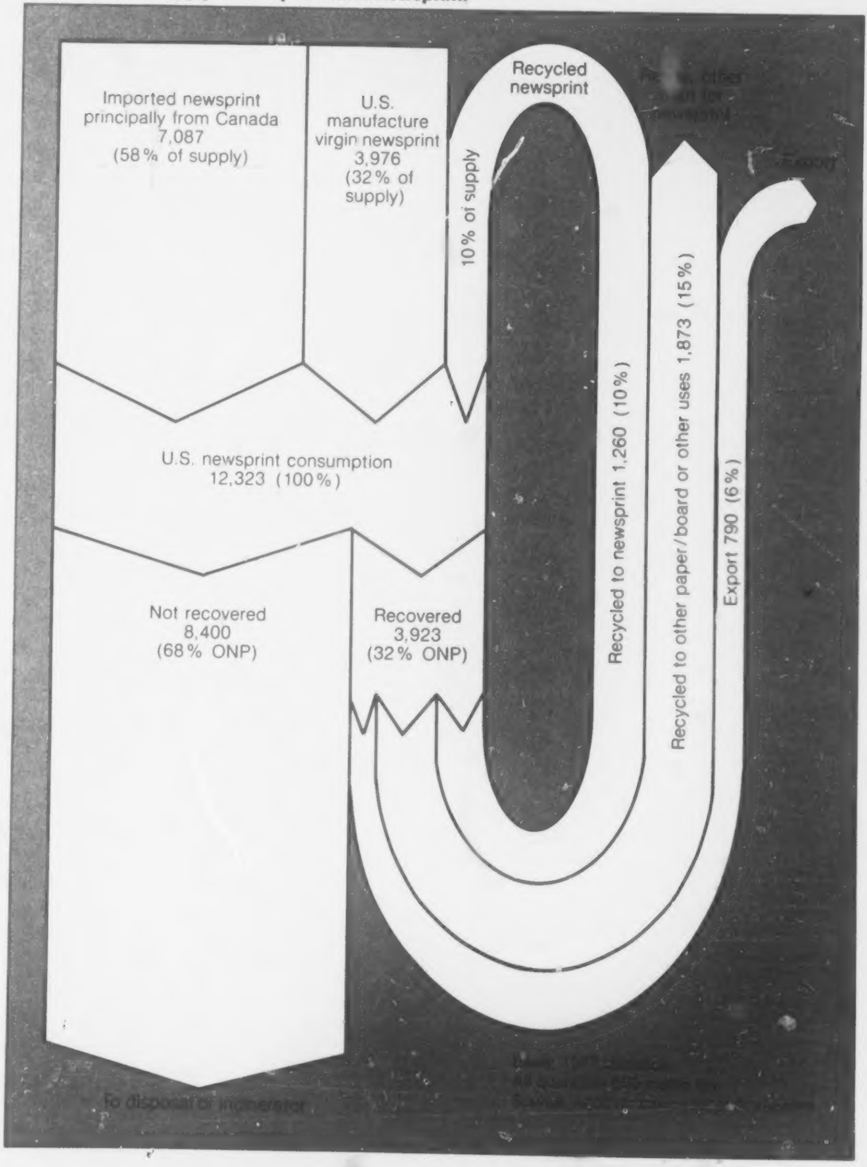
In the virgin fiber process, pulpwood is delivered to the mill as logs, the logs are debarked and chipped, and the chips are converted to pulp by cooking and mechanical defiberizing. Most integrated paper mills are, of necessity, closer to wood supplies than to urban areas.

Making newsprint out of clean and segregated ONP requires only deinking to produce slush pulp; the remainder of the process is similar to papermaking that starts directly from logs. It should be noted that in both processes, the product of the pulping stage is a very dilute slurry of pulp in water. It is uneconomic to dry and ship the pulp, so all U.S. newsprint mills are integrated. The virgin fiber process has a lower raw material cost but higher operating costs (particularly for power), and the process based on 100% ONP has a clear cost advantage (Table 1). However, the quality of newsprint made from 100% ONP is somewhat inferior to that produced using virgin fiber. This quality difference can be avoided by using ONP as a partial substitution rather than a 100% replacement for virgin fiber. Similar to the use of OCC as a blending fiber in manufacturing linerboard, ONP can be used to expand pulping facilities incrementally, without the costly burden of expanding wood handling and virgin fiber pulping capacity.

SUPPLY, DEMAND. Even with its cost advantages, the additional ONP pulp capacity that is slated to come online by 1991 in Dublin, Ga., totals only some 200,000 metric tpy. This is not even enough to compensate for the expected growth of about 1 million metric tpy in additional ONP that will be available by 1991. What is the problem?

The problem is that projected U.S. and Canadian installed pulping capacity for newsprint will exceed the projected demand by about 2 million metric tons, enough to preclude building significant new newsprint pulping capacity before 1992-93 at the earliest. Despite the fact that a new mill based on ONP would, under current conditions, be more economical than a virgin-fiber

FIGURE 1: **U.S. supply and disposition of newsprint.**



Imported newsprint principally from Canada 7,087 (58% of supply)
U.S. manufacture virgin newsprint 3,976 (32% of supply)
10% of supply
Recycled newsprint
Export
U.S. newsprint consumption 12,323 (100%)
Recycled to newsprint 1,260 (10%)
Recycled to other paper/board or other uses 1,873 (15%)
Export 790 (6%)
Not recovered 8,400 (68% ONP)
Recovered 3,923 (32% ONP)
To disposal or incinerator

mill, it is decidedly uneconomic to shut down an existing virgin mill and replace it with a new ONP-based mill.

This situation will continue until more newsprint pulping capacity is needed, at which time the lower operating cost should tip the balance in the incremental capacity toward ONP-based mills. As with all generalizations, the above has numerous exceptions, particularly when we consider regional supply/demand balances (Table 2).

HOW TO INCREASE ONP USE. These are some suggestions on what will not work and what might be successful for increasing ONP use:

1. Simply imposing regulations to increase the supply of ONP without increasing the demand for ONP will not alleviate the burden of ONP in the solid-waste stream.

2. Imposing arbitrary targets for percent recovery of ONP and arbitrary timetables for achieving the targets will not create additional demand for ONP.

3. Setting up wastepaper collection and distribution systems in parallel or competition with the existing wastepaper dealers will not create any more demand for ONP and will cause confusion in the existing industry and market. The existing system will supply ONP to keep pace with any increase in demand, without the need for outside initiatives.

4. When establishing segregation and recycling ordinances, the advice of the potential user who must handle and market the product should be solicited to ensure that the regulations produce the highest possible quality of ONP for the newsprint mills.

5. Setting a minimum overall recycled content in the newsprint that is purchased for government use could be quite helpful in tilting new pulp lines toward ONP.

Although the current economics appear to favor ONP over virgin pulp as the fiber stock for newsprint, industry history, investment philosophy, and mill locations favor continuing with the traditional pulpwood feedstock. Legislative initiatives regarding investment, such as rapid depreciation or tax incentives for ONP pulping facilities, could be helpful.

Also, because of vast differences in the regional ONP supply/demand balances and in companies' ONP pulping capacities, flexible nationwide targets for ONP use would probably be more effective than regional targets or company targets. With national targets, it may be possible to permit intercompany bartering of "ONP utilization credits," i.e., a company that was using more than the target fraction of ONP in its newsprint could sell the excess credits to a company that was not in a position to use more ONP. In this way, the market would determine how the industry as a whole could best comply with the national target.

Building ONP pulping facilities requires about two years from project approval, but, in any case, there will be no need for additional newsprint pulping capacity in the U.S. before 1991. Any timetables for increased recovery/reuse of newsprint should be established with industry input so that they can be supported by the industry. ■

TABLE 1: **Operating cost comparison for newsprint manufacture.**

	Cost ($/metric ton)[1]	
	Virgin Pulp	100% ONP
Raw material	66	91
Power	157	66
Other process costs	164	158
Total cost newsprint	387	315

1. Not including investment-related costs.
Source: Andover International Associates.

TABLE 2: **Supply/demand of ONP in the U.S. (1987).**

Region	Newsprint consumption	ONP domestic use[1] Total	Newsprint manufacturing	Net ONP exports	Total ONP recovered	Recovery rate (%)
New England	746	139	0	0.3	139	19
Mid-Atlantic	2,414	634	241	83	717	30
East north central	1,908	669	122	0.8	670	35
West north central	678	54	0	0.5	64	8
South Atlantic	2,185	439	220	18	457	21[2]
East south central	409	76	0	0	76	18
West south central	1,216	128	0	204	332	27
Mountain and Pacific	2,761	810	592	457	1,267	46
Total U.S.	**12,323**	**3,220[3]**	**1,280**	**764**	**3,984[3]**	**32[3]**

1. Includes newsprint manufacture plus others (e.g., recycled board and tissue).
2. Garden State Paper Co. Inc. (Southeast Paper Manufacturing Co.) is installing a second newsprint machine at Dublin, Ga. The additional ONP demand (220,000 tpy) will increase the recovery rate to about 32%.
3. Includes 270,000 tpy used for insulation manufacture. This additional amount is not distributed on a regional basis by API.
Source: Andover International Associates.

ISSUE FOCUS: **STOCK PREPARATION/RECYCLING**

U.S. LEADS THE WORLD IN PRODUCTION AND CONSUMPTION OF WASTEPAPER

Increasing recovery and reuse is expected to continue, but it will depend on many factors in addition to environmental pressures

By MATTI OLKINUORA

It probably does not surprise anyone that the U.S. is the world's largest source of wastepaper (recovery in 1986 was 20 million tons), followed by Japan (10 million tons) and Fed. Rep. Germany (4 to 5 million tons). These three countries are the leading consumers of paper, paperboard, and wastepaper in the world. In terms of recovery rate, included among the most efficient wastepaper collectors are countries such as Hong Kong (54%), Kuwait (53%), Japan (50%), and Taiwan (48%). In Europe, the Netherlands has a long tradition in wastepaper collection, with a high recovery rate of 46% (Table 1). Recycled fiber usage is driven by the following forces:

- Technical status, market requirements, and scale of the regional or local paper industry
- Trends in the levels of consumption of paper and paperboard
- Development trends in wastepaper collection, trade flows, and processing technologies and their impact on the availability of suitable recycled fiber in various markets
- Cost of recycled fiber compared with competing virgin fiber raw materials
- To some extent, growing ecological and environmental pressures.

CONSUMPTION AND UTILIZATION. Considerable regional differences exist in recycled fiber usage. The three leading consumers are the U.S. (16 million tons), Japan (11 million tons), and Fed. Rep. Germany (4 million tons), accounting for almost half of the world's total consumption (Table 2).

Recycled fiber's relative importance as a raw material of the paper industry is quite pronounced in the Asian and Latin American countries, which utilize an average of 40% to 46% of waste-based materials in their fiber furnish compared with, for example, North America's fairly modest 25%. In Western Europe, the average wastepaper proportions have traditionally been at an extremely low level (for example, Sweden at 11% and Finland at 4% [Figure 3]).

Mr. Olkinuora is vice president-marketing research, Jaakko Pöyry Oy, Helsinki, Finland. This article originally appeared in the company's "Know-How Wire" publication.

TABLE 1: **Wastepaper consumption vs paper and paperboard consumption, 1986.**

	Paper and paperboard consumption	Wastepaper recovery (million tons)	Wastepaper recovery rate (%)
U.S.	71.6	19.6	27.4
Japan	21.0	10.5	50.0
Fed. Rep. Germany	10.5	4.5	42.9
People's Rep. China	10.9	2.1	19.3
U.S.S.R.	9.8	1.9	19.4
U.K.	8.4	2.4	28.6
France	7.2	2.1	29.2
Canada	5.6	1.1	19.6
Italy	5.2	1.1	26.9
Brazil	4.1	1.3	31.7
Others	49.3	16.0	32.5
World total	**203.6**	**62.9**	**30.9**

TABLE 2: **Wastepaper consumption vs paper and paperboard production, 1986.**

	Paper and paperboard consumption	Wastepaper recovery (million tons)	Wastepaper utilization rate (%)
U.S.	65.0	16.3	25.1
Japan	21.1	10.7	50.7
Canada	15.1	1.5	9.9
U.S.S.R.	10.4	1.7	16.3
People's Rep. China	10.0	2.1	21.0
Fed. Rep. Germany	9.4	4.1	43.6
Finland	7.5	0.3	4.0
Sweden	7.4	0.8	10.8
France	6.5	2.0	35.7
Italy	4.6	2.0	43.5
Others	47.7	22.2	46.5
World total	**203.8**	**63.7**	**31.3**

Wastepaper suitable for recycling consist of various grades, excluding "disposable" grades, such as tissue paper, wallpaper, and cigarette paper. Books and documents tend to have a long life and rarely find their way to recycling. The best grades for recycling are mainly telephone directories, newspapers, magazines, printed advertising material, carton boards, and corrugated containers. Paper should be free of extras (envelope windows, samples attached, heavy gluing, etc.).

The most desirable raw materials are acquired from printing waste. Almost 100% of these products are recy-

FIGURE 1: **Total fiber consumption in paper and board production, 1986 (total fiber = 210 million tons).**

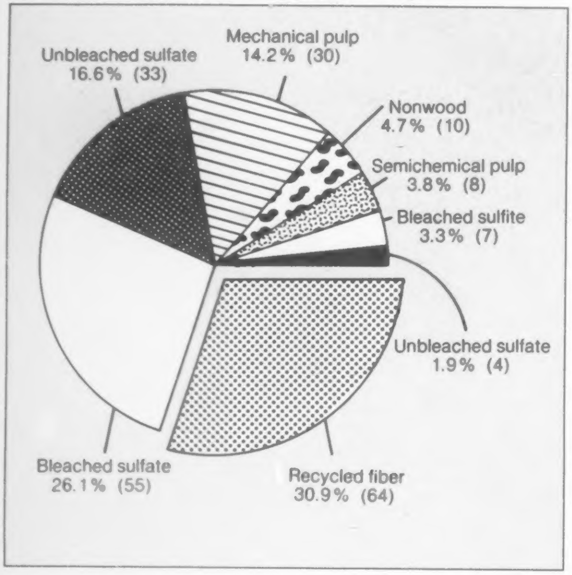


FIGURE 2: **Changes in world paper and paperboard furnish components, 1973-2000.**

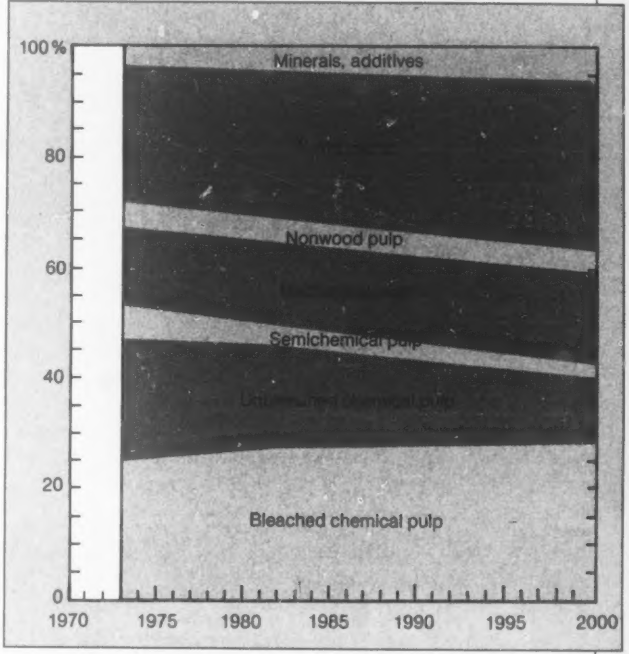
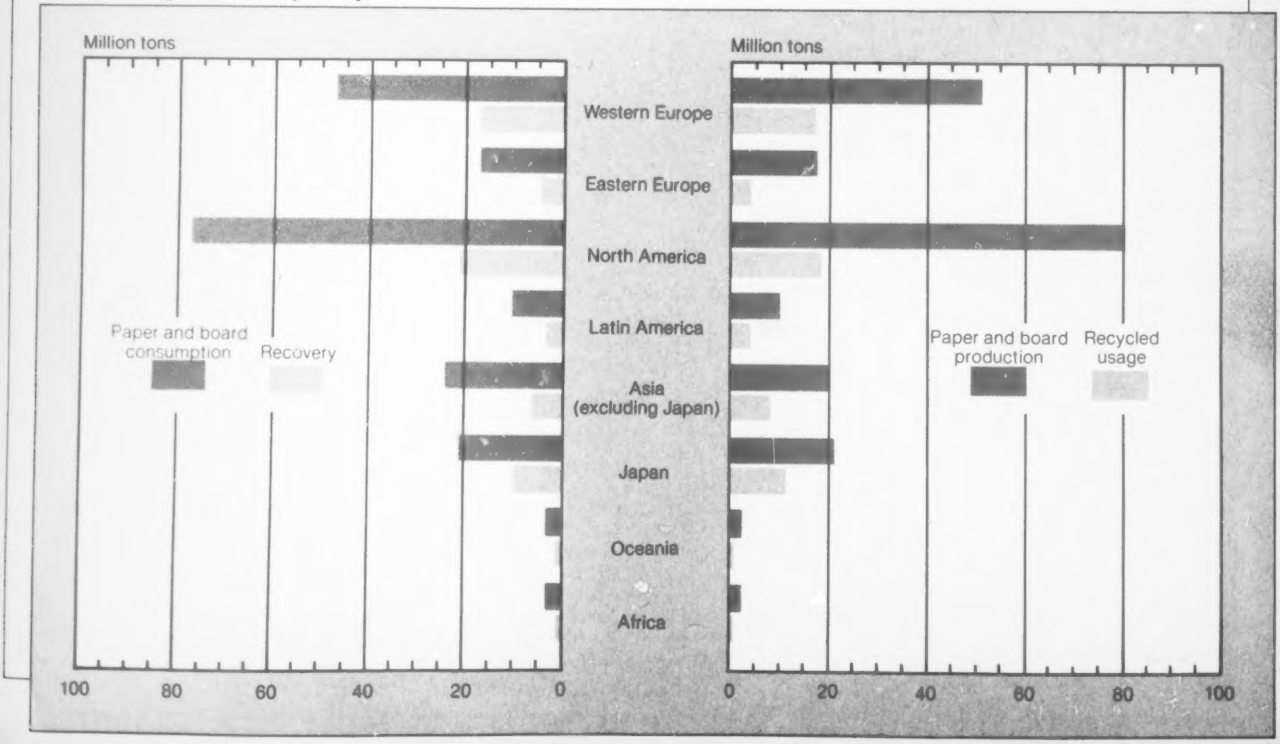


FIGURE 3: **Usage and recovery of recycled fiber.**



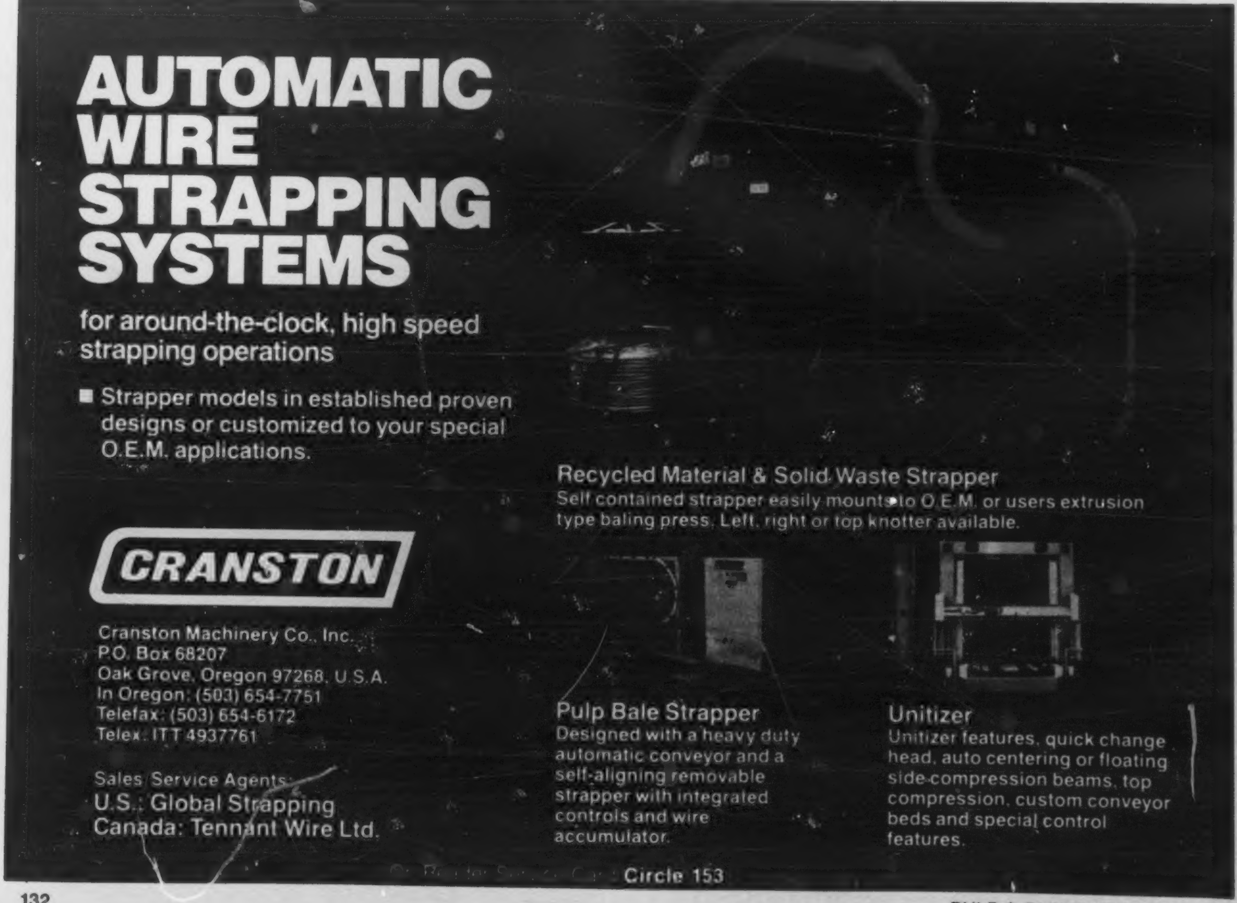
clable, contrary to, for example, household waste, of which over 15% is normally unusable. Other important sources of wastepaper supply are department stores, supermarkets and other enterprises, industrial units, converting plants, and offices. Wastepaper is generally classified and priced according to quality, starting with higher quality (white clippings, newspapers, magazines) and ending with brown paperboard grades and mixed unsorted waste.

WASTEPAPER AS A COMMODITY. Wastepaper has gradually become a marked international trade commodity too. Overall tonnage of wastepaper crossing country borders today exceeds 8 million tons. Almost half of this tonnage originates from the U.S. and is comprised mostly of old corrugated containers (OCC), telephone directories, etc. The world's main importing regions are Asia (more than 3 million tons) and Western Europe (3 million tons, mainly from regional sources).

WIDE RANGE OF END-USE APPLICATIONS. Unprocessed wastepaper has traditionally found its main end uses in the manufacture of lower-grade paper and paperboard products, mainly intended for various packaging or construction purposes. In addition to these products, sorted or deinked waste is currently used for many demanding end products, such as newsprint, printing and writing paper, tissue, packaging paper, various corrugated board raw materials, and carton boards.

The term "wastepaper" may give one the impression of something with inferior quality, but this is not the case with several recycled-fiber-based products meeting high international quality standards. Some newsprint mills are reportedly producing 100%-wastepaper-based newsprint. Printing and writing paper producers could also be using recycled fiber to a greater degree, but quality requirements are still so high that it is unlikely the share will increase notably. It is also doubtful that recycled fiber will gain more ground in the production of specialty grades such as security and telefax paper.

DEMAND FOR RECYCLED-FIBER-BASED PRODUCTS. It is safe to predict that the rapid average growth rate for consumption of recycled fiber will continue in the medium and long terms. This forecast is based on both past developments and increasing activity in product and process R&D. Therefore, the term "wastepaper-based product" may become even more misleading in the future. ■



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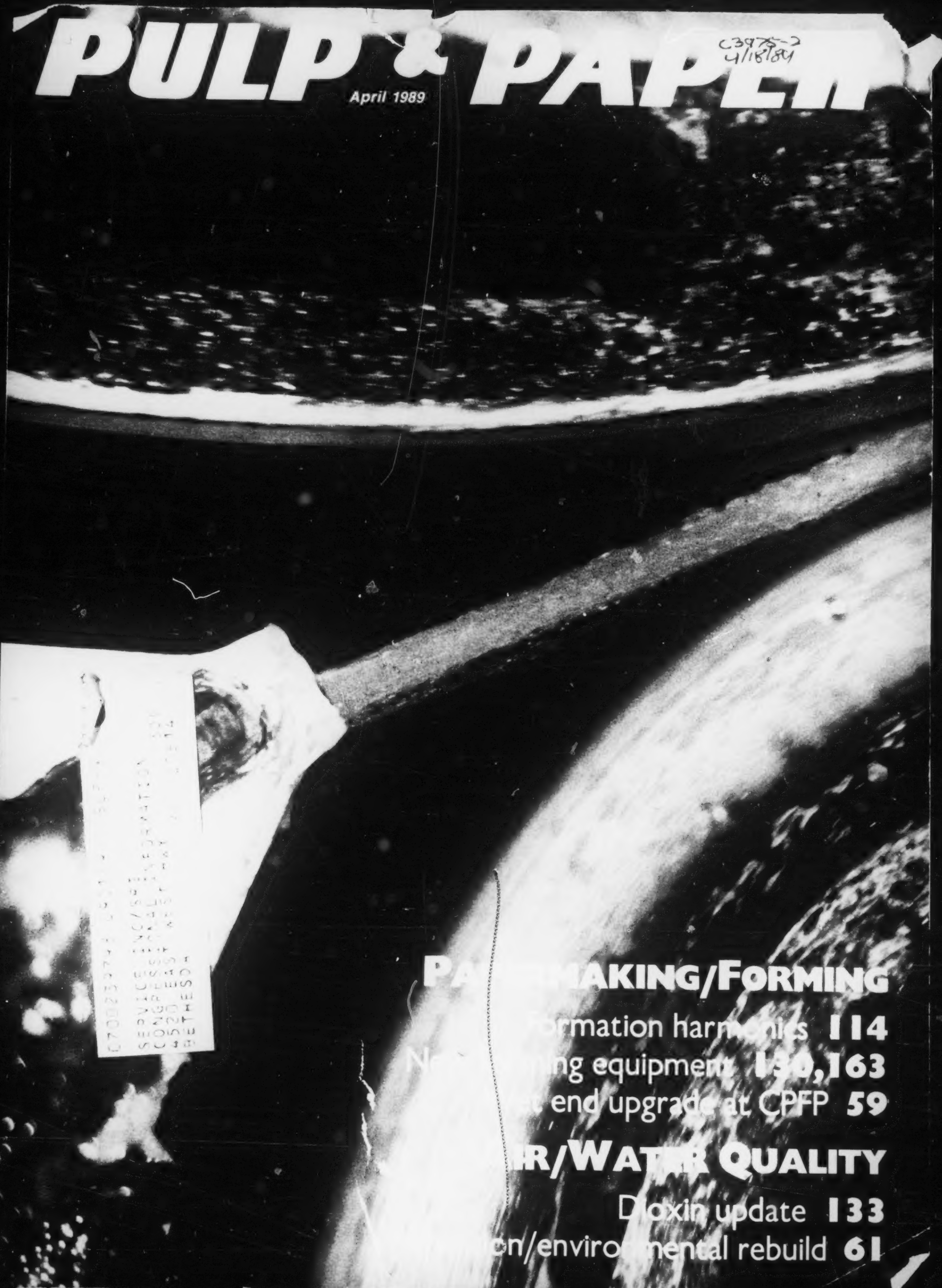

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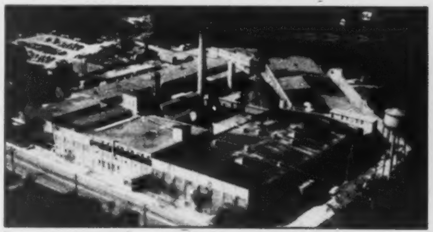

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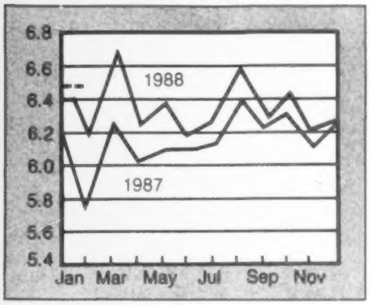
MONTH IN STATISTICS

U.S. paper and board production



U.S. production of paper and paperboard totaled 6.5 million tons in January, up 0.7% from last year, according to American Paper Institute data. The seasonally adjusted annual rate was 76.5 million tpy overall, a slight 0.3% ahead of last year. The Commerce Dept. reported that paper, board, and products imports rose 0.2% in 1988, while exports climbed 7.0%. Exports of paper totaled a record 1.1 million tons, up 19.8% from 1987.

Among major grades, printing and writing grades suffered a decline of 2.6% due to weaker uncoated free-sheet and coated paper shipments. Uncoated groundwood and bristols remained strong, however. API reports that the major strengths in the printing paper markets are in office reprographics, commercial printing, and business forms converting. Containerboard production for domestic use was up 1.3%, as were fiber box shipments, after adjustment for an extra day in January 1989.

Canadian newsprint shipments totaled 763,000 metric tons in January, up 6.6% from a year earlier, according to the Canadian Pulp & Paper Assn. Woodpulp shipments dipped to 611,000 tons, off 0.3% from January 1988. Newsprint mills operated at 98% for the month, 1% higher than pulp mills. ■

		Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION[1]					
Newsprint	Jan.	512	2.6	6,088	1.7
Uncoated groundwood (s)	Jan.	143	11.7	1,720	12.3
Coated paper (s)	Jan.	627	-1.7	7,526	-1.6
Uncoated free-sheet (s)	Jan.	890	-5.7	10,685	-5.6
Other printing/writing	Jan.	124	1.6	1,484	2.8
Total packaging and other paper (s)	Jan.	456	3.6	5,472	2.9
Tissue	Jan.	401	-10.1	5,771	7.2
Total paper	**Jan.**	**3,229**	**0.4**	**38,746**	**0.2**
Unbleached kraft paperboard	Jan.	1,667	1.8	19,995	1.7
Semichemical medium	Jan.	495	1.4	5,937	1.3
Bleached paperboard	Jan.	377	0.3	4,526	-0.2
Recycled paperboard	Jan.	744	-0.7	8,926	-0.2
Total paperboard	**Jan.**	**3,282**	**1.0**	**39,384**	**1.0**
Total U.S. paper and paperboard output	**Jan.**	**6,511**	**0.7**	**78,130**	**0.6**
PULP, WASTEPAPER & FIBER[2]					
Total U.S. woodpulp production	Dec.	5,282	2.4	61,210	2.0
Market pulp production	Dec.	764	5.7	8,455	4.2
Wastepaper consumption at paper/board mills	Dec.	1,507	1.2	18,859	3.2
Pulpwood consumption (cords)	Dec.	8,198	0.4	95,497	1.7
CONVERTED PRODUCTS STATISTICS[3]					
Corrugated box shipments (billion ft²)	Jan.	26.444	6.4	26.444[6]	6.4
Containerboard inventories at U.S. box plants and mills	Jan. 1	2,551	2.6		
INTERNATIONAL TRADE[2]					
U.S. paper imports (including products)	Dec.	794	-21.4	12,553	0.2
Imports of Canadian newsprint	Dec.	523	-21.8	8,288[6]	-3.5
U.S. paper exports (including products)	Dec.	490	6.5	5,560	7.0
Exports of unbleached kraft linerboard	Dec.	185	-1.1	2,141	-2.5
Exports of woodpulp	Dec.	573	8.7	5,528	13.1
Norscan pulp inventories[4]	Jan. 31	874	-4.5		
Norscan pulp operating rates[4]	Dec.	100%	97%	99%	100%
CANADIAN STATISTICS[5] *(reported in metric tons)*					
Total newsprint shipments	Jan.	763	6.6	763[6]	6.6
Operating rates	Jan.	98%	99%	98%	99%
Inventories held by U.S. consumers	Jan. 31	1,478	3.3		
Other paper/board shipments	Jan.	545	4.0	545	4.0
Woodpulp shipments (export only)	Jan.	611	-0.3	611	-0.3
Operating rates	Jan.	97%	97%	97%	97%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

Uncoated free-sheet: Pricing stabilizes as market demand moderates; cut-size still strong

Grade structure: Uncoated free-sheet (wood-free) paper contains no more than 10% mechanical pulp (often none). The balance is chemical (kraft) woodpulp. Excluded are uncoated groundwood, cotton fiber, bristols, and thin paper. Major end uses include business paper, such as stationery, reprographic, forms bond, tablet, and envelope, plus printing paper, such as offset, cover and text, and miscellaneous (i.e., technical, papeterie, or colored school).

A major trend in the uncoated white papers sector is the move to alkaline sizing. International Paper Co. is converting its Springhill and Hammermill mills to alkaline, and some new projects, including Willamette Industries Inc., Bennett, S.C., and Weyerhaeuser Canada Ltd., Prince Albert, Sask., are also alkaline.

Production/capacity: Paper used in advanced office technologies, primarily computers and copiers, continues to push up demand of uncoated free-sheet grades. Mills increased production by 3.5% in 1988 over the prior year. That compares with 5.5% production growth in 1987.

Capacity is also continuing to advance, rising 3.5% in 1988, according to the American Paper Institute. This growth is slower than in both 1986 and 1987. API expects a slight increase of 3.8% capacity growth in 1989. During 1988, Georgia-Pacific Corp. brought online a 290,000-short-tpy machine in Port Hudson, La., and Weyerhaeuser started up a 239,000-short-tpy machine in Saskatchewan. Approximately 150,000 short tons of additional capacity was achieved by IP by "debottlenecking" operations at various mills.

New capacity will come online this year at Domtar Inc.'s second 176,000-short-tpy machine at Windsor, Que., Canadian Pacific Forest Products in Dryden, Ont. (193,000 short tpy), and G-P's second 290,000-short-tpy machine at Port Hudson. In addition, IP/Hammermill will increase capacity 200,000 short tpy through speedups and rebuilds, Mohawk Paper Mills Inc. will add 15,000 to 20,000 tpy at its Cohoes and Waterford, N.Y., mills, and Kimberly-Clark Corp. will increase white papers capacity at Whiting, Wis., by 30,000 short tons. About 1.5 million additional tons will come onstream from 1990 to 1992, most via new machines.

Outlook: Operating rates at uncoated free-sheet mills are expected to be 97.3% in 1989, compared with 97.4% in 1988. Demand will remain relatively strong through this year, though orders for some grades, such as offset, are already mellowing after a frenetic 1988. As demand calms down and new machines come up, any allocations that remain are likely to be rescinded except, perhaps, for cut-size reprographic papers. Should the economy slow down as expected in the second half, paper will more likely become available.

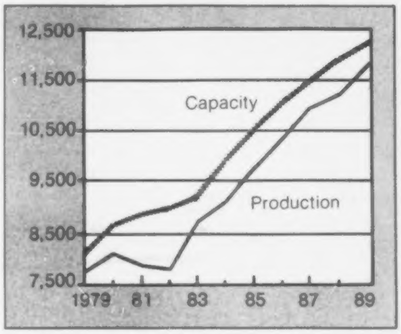
Imports are expected to advance as much as 13% in 1989 from 1988, compared with about 22.5% in 1988 over 1987.

Pricing: Mills lifted prices on uncoated free-sheet grades in 1987, 1988, and first-quarter 1989. These increases brought the significant grades of paper—cut-size, forms bond, and offset—to levels above their previous highs of 1984. Most mills had customers on at least limited allocation in 1988, but many of the restrictions were dropped at the end of the year as demand eased slightly for some grades, such as offset. Discounting on forms brought that grade to about $20/ton more than the earlier list of $860. Cut-size paper was not as subject to discounting at the start of the year.

Price trends for two important grades are (year-end, $/short ton, list) book paper, No. 3 offset, 45-lb sheets: 1984, $880; 1985, $800; 1986, $850; 1987, $850; 1988, $1,020. Forms bond, 15-lb rolls: 1984, $680; 1985, $600; 1986, $620; 1987, $760; 1988, $910.

Markets: Subgrade market shares in 1989 will be as follows: bond and reprographic, 26%; mimeo and duplicating, 1%; forms, 20%; offset printing, 26%; envelope, 10%; tablet, 4%; carbonless, 6%; and other, 7%.

SUPPLY/DEMAND (000 tons)



FORECAST (000 tons)

	1987	1988	1989e
Production[1]	10,977	11,356	11,824
Capacity[2]	11,493	11,897	12,352
Utilization rate	95.5	95.5	95.7
Imports	417	580e	640
Exports	68	78e	80
Apparent U.S. consumption	11,326	11,858	12,384
lb/capita	92.1	96.4	100.0
GNP ratio[3]	5.89[4]	5.93	6.06

e = Estimate.

1. *P&P* estimate.
2. American Paper Institute.
3. 1,000 tons/billion $ real GNP.
4. Revised.

TOP U.S. PRODUCERS (000 tpy)

	Annual capacity	Market share (%)
1. International Paper	2,100	17.0
2. Champion	1,114[1]	9.0
3. Georgia-Pacific	1,100	8.9
4. Boise Cascade	910	7.4
5. James River	872	7.1
6. Great Northern	870	7.0
7. Weyerhaeuser	807[2]	6.5
8. Union Camp	800	6.5
9. Mead	445[3]	3.6
10. P.H. Glatfelter	420	3.4

Market share of top five companies:
49.4%

Market share of top ten companies:
76.4%

Total U.S. capacity (1989):
12.352 million short tons

1. 1988 production.
2. Includes Prince Albert, Sask.
3. Includes carbonless basestock.

MARKET PULP

Millar Western to build mill in Saskatchewan

Millar Western Industries Ltd. announced that it plans to construct a 240,000-metric-tpy bleached chemithermomechanical pulp (BCTMP) mill near Meadow Lake, Sask. Startup of the new facility is tentatively scheduled for early 1992 if all goes well with funding plans and environmental and other approvals.

The plans call for a greenfield mill almost identical to Millar Western's Whitecourt, Alta., 210,000-tpy BCTMP mill, which was brought online late last summer, said MacKenzie Millar, president of Millar Western. The mill would be mostly, if not completely, based on aspen fiber, drawing from the mix of hardwood and softwood trees in nearby timberlands that are now licensed under a Forest Management License Agreement to Norsask Forest Products Ltd. In addition, a small amount of chips from the nearby Norsask sawmill would also be used.

Under a proposed agreement, Millar Western would own part of Norsask, but it would run the new pulp mill separately under a subsidiary to be called Millar Western Pulp Meadow Lake Ltd. Norsask is a 16-year-old sawmill that was sold by the province last year to a group of investors made up of employees and a local Indian band.

In making the announcement, Eric Berntson, Saskatchewan deputy premier, indicated that the mill would "provide a stabilizing influence on the surrounding communities and a base for economic growth." The mill will employ about 110 people directly, as well as employing 250 people in related jobs, and it will generate approximately 1.2 million construction labor hours.

Millar Western is presently waiting for the results of an environmental impact assessment, which is expected in two to three months. If all goes well, site preparation will begin this fall, with completion of the building foundation and a warehouse by year-end. The mill could start up as early as late 1991, but early 1992 appears to be more probable, according to Millar.

The Saskatchewan government is planning to help finance the C$235-million project, but the details have not yet been worked out. In addition, Millar Western is also asking the federal government's Western Diversification Fund for C$50 million that would go toward the cost of infrastructure, indicating that the mill site has some "unique water, power, and road requirements."

The government assistance package that is being considered has been compared with the financial help that Millar Western received from the Alberta government for the Whitecourt mill, which cost approximately C$200 million to construct. In that case, the province purchased C$120 million in participating debentures, which will provide solid backing to attract other investors.

Millar said that the output from the Meadow Lake facility would be sold through the company's Edmonton, Alta.-based sales force and would be aimed at the same markets as the Whitecourt mill's production. Shipments are currently split just about evenly between tissue/toweling and printing/writing paper end uses, he said.

Whitecourt's second pulping line, which is dedicated to production of 100% aspen-based printing/writing-grade pulp, began operations at the end of last fall, and the mill has recently been operating at an average rate of 500 tpd, according to Miller. "Both lines are running very well, and we're ecstatic about the quality of the pulp that's coming out," he said.

- Millar Western Pulp Ltd. has announced that it will invest another C$2.5 million at its Whitecourt, Alta., 210,000-metric-tpy bleached chemithermomechanical market pulp mill to further reduce pollution levels of effluent discharged into the Athabasca River and to meet provincial water quality standards. The company indicated that it had expected its existing effluent treatment equipment to be adequate when the mill started up last August.

The pollution problem was discovered by the Alberta Environment Dept. in the mill's January report on operations, which showed that biomass levels of wastewater discharge from the mill exceeded standards. Millar Western was given a deadline of Oct. 31 to comply with a Water Quality Control Order. Plans call for the addition of an activated sludge treatment process and a secondary clarifier to the mill's current wastewater treatment system by November of this year. ■

North American chemi-thermomechanical pulp capacity expansions, 1988-92.

Announced	Mill	Capacity (metric tpy)	Startup
Cascades Inc.	Port Cartier, Que.	210,000	1988
Fibreco Export Inc.	Taylor, B.C.	180,000*	1988
Quesnel River Pulp[1]	Quesnel, B.C.	108,000	1988
Millar Western Pulp Ltd.	Whitecourt, Alta.	210,000*	1988
Tembec Inc.	Temiscaming, Que.	35,000	1989
Donohue Matane Inc.[2]	Matane, Que.	190,000*	1990
Louisiana-Pacific Corp.	Chetwynd, B.C.	155,000*	1991
Alberta Energy Corp.	Lesser Slave Lake, Alta.	110,000*	1991
Millar Western Pulp Ltd.	Meadow Lake, Sask.	240,000*	1992
Proposed			
Alcan Aluminum Ltd.	Vanderhoof, B.C.	n.a.*	n.a.
Shinho Paper Manufacturing	Thunder Bay, Ont.	120,000*	1990
Tembec Inc.	Temiscaming, Que.	100,000	n.a.
Fibreco Export Inc.	Taylor, B.C.	180,500	n.a.

n.a.—not available.

*Greenfield sites.

1. Joint venture 50:50 owned by Daishowa Canada Co. Ltd. and West Fraser Mills Ltd.
2. Joint venture of Donohue and Rexfor.

Longview Fibre adopts "poison pill" plan

Amidst continuing speculation of an impending takeover of Longview Fibre Co., the company adopted a "poison pill" measure, which caused its stock price to jump. Since late last year, WTD Industries Inc. has been mentioned as the most likely suitor, although the rumors have not been confirmed.

Longview vice president-finance, Ray McDermott, said the poison pill plan, which allows shareholders to purchase more stock in the event of an unsolicited takeover attempt, "was not in response to anything directly."

USA Today reported that the Mack Brothers of New Jersey, who own at least 4.8% of Longview's stock, were other likely contenders for control of the company. It was also reported that Paine Webber was rumored to be raising financing for a group to take over the company for at least $100/share.

Recently, Oppenheimer & Co. analyst Gary Palmero said that Longview's stock was overvalued and that WTD was not considered a "credible buyer." Longview's stock has gone from a low of 44½ to a high of 78 over the past year. ■

SALES AND EARNINGS

Canadian profits rose despite strong currency

For the second year in a row, the Canadian pulp and paper industry operated near full capacity in 1988, resulting in a 22.5% increase in earnings on a 6.2% rise in sales. A sellers market for pulp helped offset losses incurred from the rising Canadian dollar. The Canadian dollar opened the year at US77¢ and rose to US84¢ by year-end, averaging 81¢ over the year vs 75¢ in 1987.

As the industry rolls into 1989, paper company executives are cautiously watching for increased competition from U.S. firms because of the volatile U.S. dollar. Newsprint producers are grappling with swelling inventories, and downtime has already been slated by some mills.

Abitibi-Price Inc. racked up a 49.7% increase in earnings on sales of C$3.3 billion. The company reported that its earnings improved thanks to higher prices for most key products, higher volumes, and benefits realized from capital expenditures on the conversion and modernization of several of its facilities. Newsprint group capacity operations, when combined with price increases, more than offset the impact of the weakening U.S. dollar and led to record sales and operating profit. Bernd K. Koken, chairman and CEO, observed that both the Printing Papers and Diversified Groups reported strong gains, and he expects further growth in 1989. However, Koken noted that the newsprint group, given the new capacity expected to come online and the continuation of a weak U.S. dollar, will most likely not reach the level this year that it achieved in 1988.

Noranda Forest Inc.'s earnings improved 29.6% to $263 million on sales of $4.7 billion. The company said that although an improvement from 1987, the figures for 1988 reflect the negative impact of the stronger Canadian dollar, higher interest rates, and a wildcat strike at MacMillan Bloedel Ltd.'s Powell River, B.C., operation. Strong markets for most of the company's products helped to offset the decline in the wood products sector. As with several other Canadian forest products companies, Noranda's competitive position in wood products continued to erode in British Columbia and Quebec as a result of what it called the punitive stumpage systems imposed in those provinces and the softening world market for wood products.

Strong prices for pulp and containerboard products as well as newsprint boosted MacMillan Bloedel's 1988 earnings to a record $329 million on sales of $3.3 billion. The company attributes part of the strong showing to Dutch affiliate KNP, which it says has a healthy foothold in the European fine paper market. MB president and CEO Ray Smith said 1988's performance produced the company's strongest balance sheet ever. Early indications in 1989 are that markets for pulp, newsprint, linerboard, and corrugated medium should remain reasonably strong throughout the year, although signs of a softening lumber market are cause for some concern, noted Smith.

Canadian Pacific Forest Products Ltd. posted a 51% improvement in earnings to $323.4 million on sales of $3 billion. Chairman, president, and CEO Cecil S. Flenniken cited higher prices in most of the company's product lines and increased shipments as reasons for the improvement. The strong Canadian dollar caused the earnings growth to lag a bit, however, as more than half of CPFP's sales are made in U.S. dollars.

Consolidated-Bathurst Inc. had an

Canadian paper industry results.

	Year-end (C$000)			
Companies	**Sales 1988**	**% change**	**Earnings 1988[1]**	**% change**
Abitibi-Price Inc.	$3,304,500	10.6%	188,200	49.7%
Canfor Corp.	1,084,200	−12.9	101,600[2]	−4.2
Canadian Pacific	3,000,000	7.1	323,400[2]	11.8
Cascades Inc.	588,792	11.6	32,505	51.0
Consolidated-Bathurst Inc.	2,372,000	4.9	239,600[2]	11.8
Domtar Inc.	2,700,000	5.1	111,000	−31.1
Donohue Inc.	648,300	27.1	68,700	55.4
Fletcher Challenge	1,500,000	7.1	180,200	28.5
MacMillan Bloedel Ltd.	3,273,500	4.4	329,800	17.5
Noranda Forest Inc.	4,700,000	4.4	263,000	29.6
Repap Enterprises Inc.	1,030,000	11.1	92,800	48.5
Scott Paper Ltd.	313,173	8.6	16,245	11.9
Weldwood of Canada	894,500	20.7	62,000	30.3
Total	**$25,408,965**	**6.2%**	**$2,009,050**	**22.5%**

1. Income after taxes from continuing operations, excluding the most significant nonrecurring items in both years.
2. **Canfor:** Income includes extraordinary gains of $78.4 million related to Howe Sound Pulp & Paper and the reorganization of Canfor U.S.A. **Consolidated-Bathurst:** The year-ago net reflects a $32.9-million special gain. **Canadian Pacific Forest Products:** Net earnings for 1987 were derived based on the number of shares that would have been outstanding had the merger of GLFP and CIP taken place on Jan. 1, 1987.

11.8% increase in earnings to $239 million on sales of $2.3 billion. The company attributed the improvement to better prices for all pulp and paper products and strong results in its U.K. newsprint operations. The increase was offset somewhat by the lower U.S. dollar and reduced shipments.

Overall earnings for Domtar Inc. dropped 31.1% in 1988 to $111 million. Operating profit for the pulp and fine paper businesses declined as a result of the Quévillon pulp mill strike, which significantly reduced shipments of market pulp and also adversely affected the startup of the rehabilitated Windsor mill and operation of the company's other fine paper mills. Profits for newsprint and groundwood specialty paper as well as packaging products increased due to higher selling prices.

Repap Enterprise Corp. generated earnings of $92.8 million in 1988—an increase of 48.5% over 1987. The company enjoyed sales of $1 billion, up 11.1% from 1987. Both the expansion at Miramichi Pulp & Paper Co. and an $80-million modernization at the Skeena pulp complex are expected to be completed this year.

- Stone Container Corp. enjoyed a net income in 1988 of $341.8 million—an 111.9% increase over 1987. Sales increased 15.7% to $3.7 billion. Fourth-quarter 1988 earnings rose 88.1% to $109.3 million, including a gain of $17.3 million relating to the transfer of 50% of Stone's ownership interest in a subsidiary. "While the major factor contributing to the strong earnings has been the continuing strong demand for our products, we have also benefited from programs that have increased productivity and reduced costs," said Roger W. Stone, chairman, president, and CEO.
- Temple-Inland Inc. enjoyed an increase in earnings of 40.9% on sales of $1.8 billion. Fibreboard Corp.'s earnings dropped 39.3% to $817,000, excluding discontinued operations, on sales of $174 million. P.H. Glatfelter Co.'s earnings enjoyed a 49.4% jump to $82 million on increased sales of $569 million. ■

Demand still brisk coming off '88, Cavaney tells API

"The U.S. pulp and paper industry in 1989 continues to build on last year's record-breaking performance," Red Cavaney, president of the American Paper Institute, said at the opening of the trade association's 112th annual meeting, held Mar. 13 at the Waldorf Astoria in New York, N.Y. "Most of the major grades of paper and paperboard are still finding strong markets for their products, as economic growth continues," he noted. "Paper and paperboard production continues steadily at a near-record seasonally adjusted rate of about 76.5 million tpy, close to its rate of a year ago."

He said that by "virtually any measure, 1988 marked the best year of this decade for the paper industry." Advancing to a new peak for the third successive year, production of paper and paperboard for domestic use and export totaled 76.7 million tons, 3.0% ahead of 1987. Sales and capital investment also reached new highs. "Surpassing the $100 billion level for the first time, 1988 sales of companies within the paper industry reached an estimated $108 billion."

Thanks to worldwide economic growth and favorable exchange rates, U.S. producers continued to make gains in the export markets. Exports of paper, paperboard, and converted products rose 7% to 5.6 million tons in 1988 from 5.2 million the previous year. Market pulp exports rose 5% to 5.1 million tons. Wastepaper exports (largely to Pacific Rim countries) surged 27.5% to 5.6 million tons.

Imports of paper and paperboard were essentially unchanged last year. However, imports of most printing/writing grades increased rapidly, advancing 16%, and accounted for 11.5% of 1988 U.S. consumption of these grades. About half of these imports came from Canada, where new export-oriented capacity recently started up.

The U.S. paper industry increased its consumption of wastepaper in 1988 by 866,000 tons, bringing to 19.6 million tons the amount of wastepaper used by the industry in the production of paper, paperboard, and construction grades, Cavaney said. This total, an increase of 4.6% above 1987 levels, was equal to 25% of the industry's total production. Another 500,000 tons went for other uses, such as molded pulp and insulation, bringing total U.S. consumption to 20.1 million tons.

Also during 1988, net exports of wastepaper rose sharply by 1.2 million tons. Thus, total wastepaper collection in the U.S. in 1988 was about 25.5 million tons, equal to 29.9% of total paper and paperboard new supply, "the highest level in history."

"Continued growth in the paper industry depends upon sustained economic growth," Cavaney continued. "A progrowth trade policy, successful management of inflation, and reduction of the federal deficit without a major tax increase are essential ingredients for optimism on the economic front."

Cavaney said that most economists expect economic growth to continue in 1989, but at a slower pace, perhaps in the 2.5%-to-3% range. He noted that such an economic climate should enable the industry "to sustain a fourth consecutive year of advancing output." ■

CONTAINERBOARD

Nolichucky files for bankruptcy, closes mills

Nolichucky Industries Corp. has filed for bankruptcy for two closed recycled containerboard mills in Kalamazoo, Mich., and Arecibo, Puerto Rico. In a separate action, Hyde Park Paper Inc. has assumed Nolichucky's lease of James River Corp.'s idle Hyde Park, Mass., recycled paper mill. Hyde Park Paper was formed by a Boston, Mass., investment group that planned to reopen the mill by April, following a lengthy effort by local government officials, financiers, and union members to salvage the mill. The mill had operated for nearly 200 years at the Boston site but was closed by James River in December 1987.

Hyde Park Paper's president, David Weinstein, was earlier involved in efforts to keep Nolichucky solvent. Weinstein said the company plans to produce uncoated free-sheet at the mill using pulp substitute wastepaper collected from Boston office buildings. Conservatree Paper Co. tried to buy the mill last year with the intention of making recycled printing/writing paper. The mill is equipped with deinking facilities.

"This plant was operated by a major corporation. We just think there are things that a small entrepreneurial company can do that a major corporation can't do," Weinstein said with reference to James River. ■

PULP & PAPER

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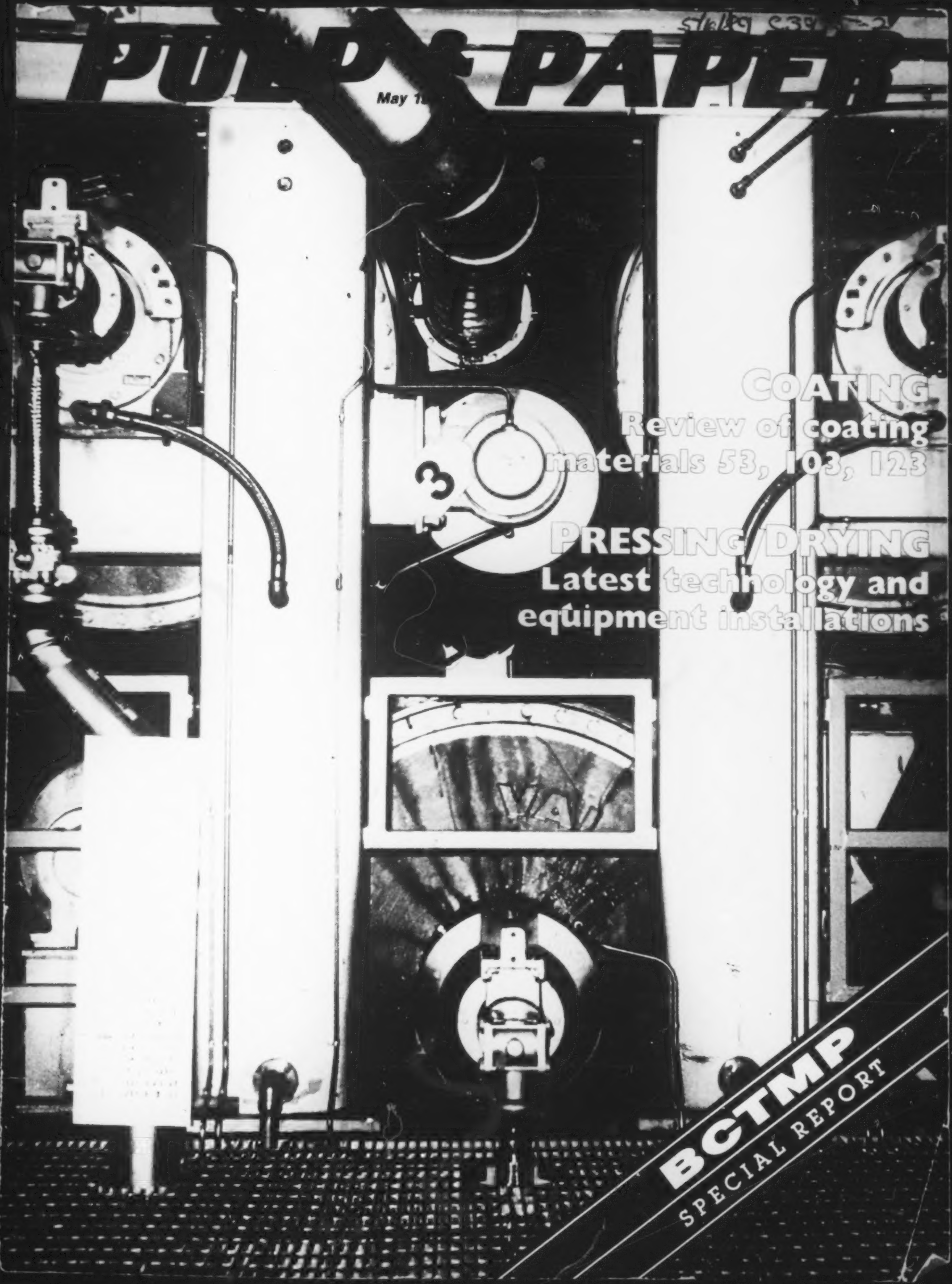

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Companies increase sales to U.S.S.R.
Japan's newsprint demand rises
UK Paper increases capacity

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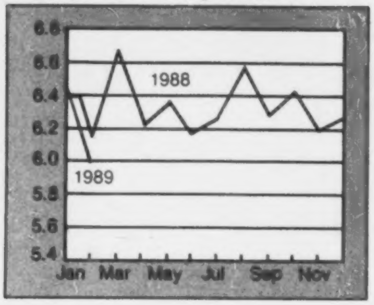
ABP

BPA

MONTH IN STATISTICS

U.S. paper and board production



U.S. production of paper and paperboard totaled 6.0 million tons in February, down 3.7% from a year earlier, according to the American Paper Institute. The decline was not really that sharp, however, because February 1988 had an extra day's worth of production due to Leap Year. On a seasonally adjusted basis, paper and paperboard production is holding its own with last year's record numbers. The adjusted annual rate for paper in February was 38.3 million tpy, an increase of 0.4% over last year, while paperboard inched up 0.2% to 38.8 million tpy.

Among major grades, uncoated groundwood paper posted the largest gains, reflecting strong demand from commercial printers and publishers of catalogs and directories. Production of containerboard for domestic use dipped 0.9% in February, but corrugated box shipments were up 2.2%, after adjusting for the extra day last year.

Canadian newsprint shipments totaled 731,000 metric tons in February, down 6.5% from a year earlier, but woodpulp shipments rose 3.4%, to 663,000 tons. Canada's exports to the U.S. rose sharply in January, led by a 25.4% jump in newsprint and a 40.6% increase in pulp. ■

		Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION[1]					
Newsprint	Feb.	445	-7.1	5,713	-2.6
Uncoated groundwood (s)	Feb.	131	1.6	1,673	8.6
Coated paper (s)	Feb.	551	-7.1	7,109	-3.8
Uncoated free-sheet (s)	Feb.	899	-2.2	11,185	0.1
Other printing/writing	Feb.	119	-6.3	1,462	0.5
Total packaging and other paper (s)	Feb.	408	-6.2	5,175	-1.9
Tissue	Feb.	435	-0.5	5,403	1.3
Total paper	**Feb.**	**2,986**	**-4.3**	**37,712**	**-0.9**
Unbleached kraft paperboard	Feb.	1,522	-2.9	19,049	-1.2
Semichemical medium	Feb.	437	-3.7	5,592	-1.1
Bleached paperboard	Feb.	338	-6.1	4,293	-3.4
Recycled paperboard	Feb.	699	-2.5	8,732	-0.7
Total paperboard	**Feb.**	**2,996**	**-3.3**	**37,666**	**-1.2**
Total U.S. paper and paperboard output	**Feb.**	**5,983**	**-3.7**	**75,378**	**-1.1**
PULP, WASTEPAPER & FIBER[2]					
Total U.S. woodpulp production	Jan.	5,471	3.7	65,653	3.2
Market pulp production	Jan.	785	8.7	9,424	8.1
Wastepaper consumption at paper/board mills	Jan.	1,573	1.2	18,878	1.2
Pulpwood consumption (cords)	Jan.	8,358	1.6	100,296	1.6
CONVERTED PRODUCTS STATISTICS[3]					
Corrugated box shipments (billion ft²)	Feb.	24.086	-2.7	50.528[6]	1.9
Containerboard inventories at U.S. box plants and mills	Feb. 1	2,719	2.1		
INTERNATIONAL TRADE[2]					
U.S. paper imports (including products)	Jan.	1,297	25.4	15,565	25.5
Imports of Canadian newsprint	Jan.	893	26.0	10,713[6]	26.0
U.S. paper exports (including products)	Jan.	439	-10.8	5,263	11.5
Exports of unbleached kraft linerboard	Jan.	160	6.7	1,918	4.5
Exports of woodpulp	Jan.	457	16.9	5,487	17.1
Norscan pulp inventories[4]	Feb. 28	890	-1.7		
Norscan pulp operating rates[4]	Feb.	98%	100%	99%	99%
CANADIAN STATISTICS[5] (reported in metric tons)					
Total newsprint shipments	Feb.	731	-6.5	1,494[6]	-0.3
Operating rates	Feb.	99%	101%	99%	100%
Inventories held by U.S. consumers	Feb. 28	1,472	-0.1		
Other paper/board shipments	Feb.	529	-0.9	1,074	1.4
Woodpulp shipments (export only)	Feb.	663	3.4	1,274	1.6
Operating rates	Feb.	95%	96%	96%	97%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) — Shipments.

Coated groundwood: New capacity, inventory reductions balance demand after buying sprees

Grade structure: Coated groundwood papers contain 10% or more mechanical pulp, with chemical pulp and fillers making up the balance. About 85% of coated groundwood production is No. 5. The rest is No. 4 grade, which has higher brightness and usually heavier basis weights (a small portion of coated groundwood is classified as No. 3). No. 5, therefore, is valued not only for its lighter basis weights but also for its runability.

Coated groundwood paper usually runs in the 32-lb to 50-lb basis weight range (25 × 38 in. in reams of 500 sheets). Some 30-lb and 70-lb papers also are made. Coating weight on lightweight coated (LWC) paper may be about 30% of total sheet weight.

The strongest competitor to coated groundwood is uncoated groundwood, particularly supercalendered. Competition occurs in many end uses, including advertising inserts and flyers, consumer and trade magazines, Sunday newspaper supplements, catalogs, directories and other books, direct mail, and other commercial printing.

Production/capacity: U.S. mills produced 10% more coated groundwood paper in 1988 than they did in 1987, a year in which shipments rose 9%. This continues the upward growth trend that began in 1984 and 1985. Commercial printing continues to be the fastest-growing end use that includes such products as advertising inserts and flyers. The largest end-use market is the snoozing magazine and periodical sector, which has remained relatively stagnant.

No new coated groundwood paper machines were brought online in 1988, but machines brought online in late 1986 reached their peak production levels. Some new tonnage will be added this year: Blandin Paper Co., a unit of Fletcher Challenge Canada Ltd., will start up its 250,000-tpy coated groundwood machine in Grand Rapids, Minn., in the second half of the year, as will Repap Enterprises Inc., with its 230,000-tpy machine in New Castle, N.B. (Canada currently has an estimated 400,000-short-tpy of coated groundwood paper capacity). The American Paper Institute said that U.S. capacity is expected to advance just under 2.3% in 1989.

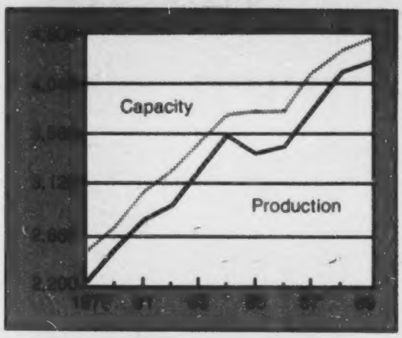
Blandin is likely to go ahead with an additional machine at Grand Rapids, while Repap may install a machine at Prince Rupert, B.C. Boise Cascade Corp. is rebuilding two machines at Rumford, Maine, though the machine now making No. 5 paper will be switched to Nos. 3 and 4 free-sheet. Pentair Inc. is upgrading its publication papers mill in Niagara, Wis., adding 40% more coated groundwood capacity, which will bring the mill rating to 320,000 tpy. Consolidated Papers Inc. is rebuilding No. 64 machine at Wisconsin River (Whiting), Wis. Weyerhaeuser Paper Co. reportedly is still considering a second LWC machine at Columbus, Miss.

Overcapacity in Europe and the desire to keep market share have kept U.S. imports of coated groundwood paper fairly level.

Outlook: Rising prices in 1987 and 1988 encouraged inventory building, especially by merchants and commercial printers, creating tight markets for most of the year. But demand started to slacken toward the end of 1988 and into 1989, so much so that an expected first- or second-quarter price increase was effectively postponed until the beginning of the third quarter. Even though some analysts still call for a recession in second-half 1989 or the beginning of 1990, most insist the paper industry will do well again in 1989. Magazines are perhaps one of the most vulnerable areas.

Prices: Strong demand and tight markets caused prices for coated groundwood papers to rise in 1988 (as they did in 1987), though by the end of the year and into early 1989 some minor discounting was reported. Because demand is expected to remain fairly constant and new capacity to rise only moderately, list prices probably will remain at current mid-year levels (if prices are raised in July), at least through the end of 1989.

Historical pricing trends ($/short ton, year-end, except 1988, which is first quarter) are: for No. 5, 34-lb roto paper, 1981, $760; 1982, $760; 1983, $782; 1984, $890; 1985, $931; 1986, $860; $1987, 890; 1988, $990; 1989, $990.



FORECAST (000 tons)

	1987	1988	1989e
Production[1]	3,782	4,160	4,335
Capacity[2]	4,136	4,376	4,478
Utilization rate	91.4	95.1	96.8
Imports	500e	591e	577
Exports	39	46	53
Apparent U.S. consumption	4,243	4,705	4,859
lb/capita	34.79	38.23	39.15
GNP ratio	2.21	2.36	2.73

e = Estimate.
1. *P&P* estimate.
2. American Paper Institute.
3. 1,000 tons/billion $ real GNP.

TOP NORTH AMERICAN PRODUCERS

(000 tpy)

	Annual capacity	Market share (%)
1. Champion	689[1]	14.3
2. International Paper	645[2]	13.4
3. Consolidated	600[2]	12.4
4. Repap[3]	450	9.3
5. Bowater	340	7.0
6. Blandin	311	6.4
7. Mead	300	6.2
8. Boise	285	5.9
9. James River	234	4.8
10. Pentair[4]	220	4.6

Market share of top five companies:
56.4%

Market share of top ten companies:
84.3%

Total North American capacity (1989):
4.828e million short tons
(U.S.: 4.478; Canada: 0.390)

1. 1988 production.
2. *P&P* estimate.
3. Includes U.S. and Canada.
4. Niagara of Wisconsin.

ACQUISITIONS/MERGERS

Repap buys Manfor, will convert to kraft pulp

Repap Enterprises Inc. said that it will buy Manfor Ltd. from the Manitoba government for C$132 million. The company will convert the existing unbleached kraft pulp and paper mill to bleached kraft pulp and then build a second line that will give the complex the capacity to produce a total of 1,700 tpd of bleached kraft pulp. The terms of the transaction call for Repap to pay the Manitoba government C$40 million in cash in addition to C$92 million in preferred Repap shares that can be redeemed at the company's option.

Repap chairman George S. Petty has been working since 1980 on a plan to buy Manfor.

Repap plans to invest C$200 million starting this spring to convert the existing pulp mill from 400 tpd of unbleached kraft to 500 tpd of bleached softwood kraft. The provincial government will provide an incentive for this phase of the project by purchasing $30 million in preferred shares. When this first phase is completed in about 18 months, the 286-in.-wide kraft paper machine will be converted to a pulp dryer. In the meantime, the company will continue to produce kraft paper.

Before the end of 1990, work will begin on the second phase of the mill upgrade. Repap is planning to invest an additional C$800 million to construct a new 1,200-tpd pulp mill at The Pas, Man. When construction of the new pulp mill is completed, Repap will convert the older, smaller mill from softwood to hardwood pulp. Part of the pulp will be used at Repap's Wisconsin coated paper complex, which has a capacity of 450,000 tpy.

The Manitoba government is committed to providing loan guarantees of C$150 million for the new mill. In addition, Repap will gain harvesting rights to about 108,000 km² (42,000 square miles) of forest lands containing about 3.2 million m³ (1.4 million cords) of timber. Repap will construct a new woodchipping facility as well as a forest-harvesting administration center in Swan River, Man. To make Repap's timber harvesting task more economical, the province will invest C$90 million to upgrade highways in northern Manitoba.

Troubled history. The provincial government has owned the mostly money-losing kraft paper and lumber concern in The Pas since Churchill Forest Industries, a predecessor company, went into receivership in 1971. Succeeding governments have been trying to sell Manfor to the private sector ever since.

The Conservative government gave a nominal value of $1 to Manfor and wrote off its investment in the company last year. Including the loss on Churchill and a debt conversion in 1983, the province has pumped more than C$250 million into the mill. A cabinet committee was formed last fall to hold discussions with companies interested in acquiring the mill. These included Weyerhaeuser Canada Ltd., Daishowa Paper Manufacturing Co. Ltd., Pentair Inc., and Repap.

Repap chairman George Petty said the company had been working on a deal to acquire Manfor since 1980. Repap's strategic plan is to change Manfor's product mix, Petty told the Toronto *Globe & Mail*. "Our fundamental assessment is that it's inappropriate to be making kraft paper out of high-quality northern spruce. We're going to upgrade the entire project to bleached chemical pulp and later add paper machines," he said.

Manfor is Canada's largest independent producer of kraft paper and the biggest exporter of unbleached kraft paper to the U.S. Using a Flakt air dryer called Super Performance Kraft (SPK), Manfor produces a high-quality paper that is used in multiwall shipping sacks. Exports to the U.S. reached nearly 80,000 tons in 1988. The pulp and paper mill has capacity to produce 140,000 tpy of paper, and an adjoining sawmill has annual capacity of 100 metric bd ft.

New job creation. Petty said Repap will create 350 to 400 new permanent jobs over the two phases of the project, which could take until 1994 to fully complete. Besides the direct employment benefits and the $1 billion in direct investment, Repap will also spend $20 million on a training program for Manfor's 850 employees.

Petty added that Manfor should be making a contribution to Repap's profits by 1990 since it has a positive cash flow. Manfor posted a modest profit of C$3.3 million in 1987, after many consecutive years of losses.

"The most significant impact of the sale is job creation. These new jobs, coupled with the massive spin-off benefits, will put northern Manitoba on a solid economic footing for the future," said Manitoba premier Gary Filmon. ■

World woodpulp requirements (millions of metric tons).

	1988	2000	Change
Bleached softwood kraft	30	43	+13
Bleached hardwood kraft	28	45	+17
Mechanical	41	57	+16
Unbleached	35	44	+ 9
Other	10	10	—
Total	**144**	**199**	**+55**

Source: Repap Enterprises Inc.

Tembec to sell 50% share of new machine to Smurfit

Jefferson Smurfit Corp. will acquire a 50% share of Tembec Inc.'s new 140,000-metric-tpy bleached paperboard mill, which Tembec is building adjacent to its existing sulfite pulp mill and Temcell bleached chemithermomechanical pulp (BCTMP) mill in Temiscaming, Que. Under the proposed agreement, Smurfit will pay about C$30 million for an undisclosed number of partnership units in Temboard & Co. Ltd. Partnership, the company Tembec formed to finance and construct the new mill.

After the units are converted into common shares and other investors are bought out, Smurfit and Tembec will each hold 50% of Temboard's equity. Other investors in the limited partnership include the Belkin family of Vancouver, B.C.; Lummus Canada, general contractor for the new mill; and Rexfor, the Quebec the headbox and fourdrinier section, from another company, but it will install new dryers, winders, and other equipment. The machine will mainly produce lightweight core stock for the tissue and toweling industry. "The strategy is to be a viable force in the lightweight core stock industry," said Robert Cloud, U.S. Paper's executive vice president and CEO.

U.S. Paper also produces core stock at its DePere, Wis., mill. Plans call for the new fourdrinier machine to produce brown grades of lightweight core stock, which will enable the machine in DePere to run white and specialty core stock grades. "This will help eliminate the costly changeover and washup time needed to go from grade to grade," said Cloud. Last year, the company produced about 55,000 tons of lightweight paperboard at Menasha and 32,000 tons of heavier-grade paperboard at DePere and reported sales of about $30 million. In January, the company acquired Ideal Paper Tubes & Cores, a small converting firm in St. Paul, Minn. ■

NEWSPRINT

U.S. newsprint consumption wanes due to shortage

Confirming its own previous prognostication, a report issued by the American Newspaper Publishers Assn. recently indicated that newsprint consumption began to decline in 1988 due to tight markets in 1987 and subsequent efforts by newspapers to reduce orders as their newsprint costs rose and their advertising revenues fell.

The December 1988 report, "The Growth and Outlook for U.S. Newspapers and Newsprint Consumption," was written for ANPA by Jon G. Udell. Citing various trends during the past ten years and projecting out to 1995, Dr. Udell uses as one of his bases the conjecture that newspapers would reduce newsprint usage in the event of rising costs resulting from tight newsprint supplies.

This emerging trend is a turnaround from the phenomenal growth rate of the past decade. From 1976 to 1987, U.S. newsprint consumption expanded 33.6% (on a 30-lb basis weight) to 12.395 million metric tons. But in 1988, the growth rate came almost to a halt—slowing in the second quarter to an increase of less than 1% over the prior year.

Dr. Udell attributes this sluggish demand to at least two key factors: a slump in advertising lineage among some major newspapers and newsprint conservation efforts stimulated by the rising cost of newsprint. These, in turn, were sparked by modest consumer spending, increased newspaper advertising rates, retail industry mergers, and reduced financial aids from institutions still recovering from the Oct. 19, 1987, stock market setback.

Another somnolent year. Newsprint consumption in the U.S. in 1989 is expected to be virtually flat from 1988 due to increasing possibilities of a recession approaching later in the year—especially if interest rates continue to rise. Even if no recession occurs, notes Dr. Udell, the economy is likely to be sluggish, with reported tonnage expected to be up only slightly to 12.4 to 12.5 million tons (on a 30-lb basis weight). In the event of a recession, consumption would decline below 1987's level.

ANPA's trend projection of U.S. newsprint consumption in 1995 is 14.5 million tons, assuming a period of severe economic stress in these years but at least a 2.5% average annual growth in the U.S. economy. If the U.S. achieves a 3% or higher average annual rate of economic expansion in this period, demand would exceed 15 million tons by 1995.

The dynamics of the newspaper and newsprint industries could reduce this rate of growth, however. For example, notes Dr. Udell, if newsprint conservation measures initiated during 1988 are sustained, it could change this figure by about 100,000 tons or more.

Looking back at the past decade, Dr. Udell notes various trends. Regional growth in newsprint consumption has been most significant in the U.S. South and West, where it has increased 37% and 34% respectively (see table). During this time, Northeast newsprint usage was up 27%, but the north central region was up just 2%. Growth rates during 1977-87 were higher in cities with populations of less than 100,000 than in large cities with populations of over 1 million—38% vs 9%. Sunday newspapers' circulation was up by 6.4 million during this time, while daily circulation grew just 0.4 million.

Preprint growth still dynamic. The amount of preprint tonnage included in daily newspapers is not known. However, Dr. Udell estimates that in 1987, insert tonnage on all grades of paper—excluding coupons and catalogs—totaled an estimated 2.147 million tons. Of this amount, almost 800,000 tons of inserts were printed on newsprint. By 1992, the report indicates, newsprint usage by producers of preprinted inserts is forecast to rise to 905,000 tons, with an average annual growth rate of 2.6%, while tonnage of all inserts is predicted to grow at least 5%/year in that time.

U.S. newsprint producers have increased their supply of newsprint to daily newspapers by 28.3% during the last ten years. Tonnage originating in Canada rose 16.4%, resulting in U.S. producers' share of the domestic market increasing to 42.1% in 1987 from 40.9% in 1977 while Canada's share declined to 55.1% from 59.1%. Offshore suppliers accounted for almost none of the U.S. market in 1977 but for 2.9% by 1987. ■

Historical trends in newsprint consumption by U.S daily newspapers in four major regions, 1977-87 (000 metric tons).

Region	1977 consumption	1987 consumption	Tons change	% change
Northeast	1,803	2,294	491	27.2%
North central	1,848	1,883	35	1.9
South	2,043	2,790	747	36.6
West	1,495	2,009	514	34.4
Total consumption by U.S. dailies	**7,189,672**	**8,976,598**	**1,786,926**	**24.9**
Total U.S. consumption by all users	**9,280,000**	**12,395,000**	**3,115,000**	**33.6**

Source: Daily newspapers reporting to the American Newspaper Publishers Assn.

COATED PAPER MARKETS STABILIZE AS CUSTOMERS DIGEST INVENTORIES

Printers and merchants built stocks anticipating price boost, but demand has calmed; mills are pushing next hike into July

By ROB GALIN, News Editor

Markets for coated papers are expected to remain in balance for the next two or three years, with capacity and production essentially in symmetry with demand, according to various paper industry sources and analysts. However, prices for both coated groundwood and coated free-sheet are expected to rise only once more this year, possibly in July.

The future for coated paper really holds no surprises for papermakers or end users. Topping the list of opportunities for coated groundwood are advertising inserts and flyers, catalogs, other commercial printing, and, perhaps, magazines, though the latter essentially will be a no-growth area. Coated free-sheet producers can look to promotional printing and annual reports for continued strong demand.

Mills had another good year in 1988, with most companies reporting record profits from all sectors. Producers shipped 7.5% more coated paper in 1988 than in 1987, resulting in a total of almost 7.4 million tons shipped. That compares with 5.0% higher shipments for all printing and writing grades in 1988.

This year started off much more slowly, with coated paper shipments in January dropping 1.6% from January 1988, according to the American Paper Institute. For full-year 1988, new orders of just over 7.4 million tons posted a gain of 5.0% over the previous year, but, here again, January 1989 posted a loss of 7.1% compared with the same month a year earlier.

One mill source said the beginning of the year was "sloppy" as a result of inventory reduction, perhaps from overbuying in 1988 in relation to actual price increases and feared price increases. However, the rest of the year should see an upturn as demand from catalog publishers comes on strong in the third quarter, possibly helping support a price increase.

Industry executives and analysts expect utilization to remain well above 90%, usually between 93% and 95%, through 1998, though William Wigder of First Boston Corp. is projecting a 96% operating rate for coated paper mills in 1989. That represents production of about 7.87 million tons, a 6.2% increase from 1988. Martin Hydell, vice president-marketing for fine papers at Mead Corp. said he is projecting good operating rates through the end of 1989 if the economy stays healthy. However, 1990 could prove to have softer markets, he said.

Offshore coated paper producers were able to take advantage of market opportunities in the U.S. last year. The U.S. Dept. of Commerce reported that imports of coated papers in all of 1988 climbed 17.0% above 1987 levels, to 788,865 tons. Discounting by offshore mills may have boosted U.S. purchases of foreign paper. In contrast, U.S. mills shipped 97,464 tons, or 3% less, of coated paper outside the country last year.

CONSUMPTION FORECAST. If analysts are correct, consumption of coated paper grades may rise 4.0% in 1989 and 4.8% in 1990. Apparent U.S. use of coated groundwood papers is to rise from an estimated 4.7 million tons in 1988 to almost 4.8 million tons this year, with a 3% increase in 1990, according to Merrill Lynch analyst Evadna Lynn.

Lynn expects that utilization of coated free-sheet grades will increase 3.1% to just over 3.5 million tons in 1989 from last year. By the end of 1990, consumption may hit almost 3.8 million tons. Wigder forecasts 6.0% average annual growth in coated free-sheet production and 6.1% growth in capacity.

Overall coated paper demand probably will continue to grow somewhat above real GNP in the next few years. API said that U.S. coated groundwood capacity rose about 5.8% to nearly 4.4 million tons in 1988, after an 8.8% increase in 1987.

Forecasts made in May 1988 by the European Paper Institute say that European operating rates in the next four years will remain under 80%. In fact, EPI estimates put excess coated groundwood tonnage at about 1.2 million metric tons in 1990, 1991, and 1992. Even this year, members of EPI may utilize mill capacity at only 79.7%, leaving 941,000 excess tons available.

Additional competition will come from the increasing capacity of high-quality supercalendered (SC) paper, such as Web-Sized Offset Paper (WSOP) from Abitibi-Price Inc.'s Kenogami, Que., mill and premium supercalendered (SC-A) paper from Lake Superior Paper Industries' mill in Duluth, Minn. Here again, Europe is expected to have about 400,000 metric tons more than demand in the 1989-92 period, with SC operating rates holding at the 87% to 88% range.

The slower market is also reflected by a decline in new orders and a reduction of backlogs. Extremely strong growth in 1988 exaggerates the picture somewhat, but the market definitely has slowed.

Also contributing to slower U.S. shipments this year and next is the continued rise in imports, which are expected to reach 850,000 tons this year and 890,000 tons in 1990. Imports are expected to reach nearly 1 million tons in 1991.

PRICES. The slight softening in demand caused by inventory "workdowns" prompted mills to put off a 1989 price increase until at least July. A recession could affect paper purchases, especially since advertisers cut promotional budgets when times are tough. If this happens, deep discounting could occur, and mills may even be forced to roll back the mid-year hike.

Prices for coated papers have not risen as often as other printing/writing grade sectors. Wigder expects coated free-sheet prices to rise 5% this year, but coated groundwood could fall 6%. However, the continuing rise in pulp prices almost guarantees paper price hikes, a mill source said. Within the various end-use sectors, commercial printing is expected to remain the strongest growth area.

Catalog markets seem to be doing well, despite increases in postal rates and paper prices, said Maxwell Sroge, a catalog industry consultant for Marke/Sroge Communications. "I think it's fairly strong right across the board," Sroge said. "I'd say the great strength is in the mid-market," which represents households with incomes of $30,000 to $50,000. Since paper prices and availability have stabilized, the threat to catalog publishers comes primarily from the U.S. Postal Service and Congress. USPS is considering another rate hike. In addition, tests indicate that 7% to 10% of catalogs mailed through the Postal Service are not delivered. To help beat the postal increases, catalog publishers are looking for high-quality, lightweight papers, Sroge said.

TABLE 1: **New North American coated paper capacity through 1991.**

Company, U.S.	**Location**	**Annual short tons**	**Grade**	**Startup**
Westvaco Corp.[1]	Luke, Md.	160,000	CGWD/CF	1984-88
Fraser Paper Ltd.	Madawaska, Maine	n.a.	CGWD	1987-88
Repap Enterprises Corp. Inc.[2]	Kimberly, Wis.	205,000	CF	1988
Blandin Paper Co.	Grand Rapids, Minn.	254,000	CGWD	1989
Potlatch Corp.[3]	Cloquet, Minn.	100,000e	CF	1989
Champion International[4]	Bucksport, Maine	n.a.	CGWD	1989
Pentair Inc.	Niagara, Wis.	90,000e	CGWD	1989-90
Champion International	Quinnesec, Mich.	285,000	CF	1990
Consolidated Papers Inc.	Wisconsin River, Wis.	n.a.	CGWD	n.a.
P.M. Glatfelter Co.[5]	Spring Grove, Pa.	16,500	CF	1990
S.D. Warren Co.	Skowhegan, Maine	215,000	CF	1990
S.D. Warren Co.	Muskegon, Mich.	45,000e	CF	1990
Westvaco Corp.[6]	Wickliffe, Ky.	n.a.	CF	1990
Boise Cascade Corp.	Rumford, Maine	46,000	CGWD/CF	1989-90
Simpson Paper Co.	Pasadena, Texas	35,000 to 40,000e	CF	1991
Blandin Paper Co.[7]	Grand Rapids, Minn.	250,000	CGWD	n.a.
Weyerhaeuser Paper Co.	Columbus, Miss.	n.a.	Under study	n.a.
Champion International	Courtland, Ala.	n.a.	CF	1989-93

Company, Canada	**Location**	**Annual metric tons**	**Grade**	**Startup**
Repap Enterprises Corp. Inc.	Newcastle, N.B.	190,000	CGWD	1990
Repap Enterprises Corp. Inc.	Prince Rupert, Sask.	190,000e	CGWD	n.a.
Island Paper Mills Co.	New Westminster, B.C.	75,000	CF	1990

e = *P&P* estimate.
CGWD = Coated groundwood.
CF = Coated free-sheet.
Sources: *Pulp & Paper Week, Pulp & Paper Project Report,* American Paper Institute, Canadian Pulp & Paper Assn.

1. Incremental additions.
2. 100,000 tpy net.
3. Conversion from uncoated to coated paper.
4. No. 4 machine speed increasing from 2,800 fpm to 3,500 fpm.
5. Reducing uncoated free-sheet capacity by 15,000 tpy.
6. Installation of off-machine coater for 550-tpd uncoated free-sheet mill. Will continue to produce uncoated papers as well as coated.
7. Awaiting final approval.

The Direct Marketing Assn. says that demand for catalogs is increasing significantly. Slightly more than 51% of the U.S. population (87.7 million Americans) shops by mail, a 15% increase from 1985, according to Simmons Market Research. This helped spur catalog production, which increased by 18% in 1986, representing 11.8 billion pieces from about 6,500 publishers.

Analysts suspect that demand for coated papers for catalogs could reach over 2 million tons by 1990. Mead forecasts catalog growth of 7.0% through 1992, accounting for 23% coated groundwood and 31% coated free-sheet paper manufactured.

Boise Cascade Corp. announced a price increase on coated No. 5 papers but withdrew it when no other mills went along. The list price for 40-lb No. 5 remains at $880/ton, with some discounting reported.

Price hikes of $60/ton for coated free-sheet grades announced by Consolidated Papers Inc. and other mills apparently have been accepted. Demand for higher-quality grades, Nos. 1 and 2, is reported to be strong.

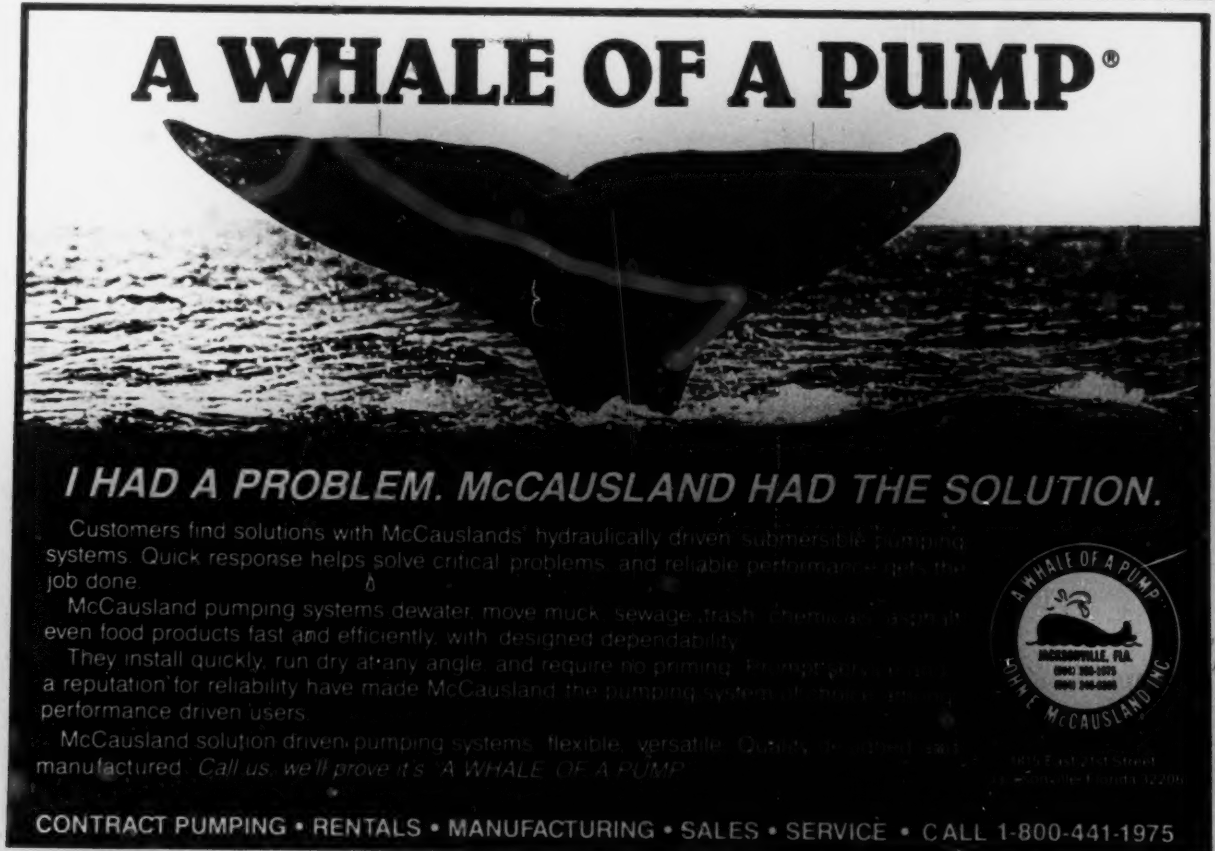
MAGAZINES "OK." Magazines did better in 1988 than expected, but gains were still relatively small, with only a 2.4% increase in the number of ad pages compared with 1987, according to the Magazine Publishers Assn. A potential advertising rate increase could create relatively stagnant markets for coated magazine papers; ad pages could even decline.

Late last year, Mead predicted magazine growth of 2.5% on average over the five years through 1992. Magazines will use 51% of the coated groundwood and 18% of the coated free-sheet paper produced.

Some periodicals, such as Sunday newspaper magazines, which formerly used uncoated groundwood papers or newsprint, have moved up to coated paper.

NEW CAPACITY COMING ONLINE. Commercial printing uses some 50+% of all coated paper production, about 2.9 million tons of coated paper in 1987. Included in the commercial printing sector are direct mail flyers and newspaper advertising inserts. Preprinted newspaper inserts are growing at a rate of about 5% to 7%/year. Use of coated paper for inserts is about 600,000 tpy, compared with 400,000 tons in 1986. Newsprint and uncoated groundwood grades make up the bulk of the remaining 2 million tons of paper used for inserts.

Book printing/publishing consumed about 300,000 tpy of coated paper in each of the years from 1984 through 1987. Demand may grow as much as 5%/year in the next one or two years. ■



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SPECIAL REPORT

BCTMP GROWTH, DEMAND TO CONTINUE WORLDWIDE DURING FUTURE DECADES

Technological advances, use of alternative wood species, and capital/operating advantages will fuel continued expansions

By PETER M. SHARMAN

The growth in capacity of market bleached chemi-thermomechanical pulp (BCTMP) has been a major topic of discussion around the world during recent months. This rapid product growth can be attributed to the following:

- Technological advances making possible the production of superior-quality, uniform pulp
- Higher capital and operating costs of chemical pulps for a given product
- The opportunity to utilize alternative wood species, such as low-density hardwoods, with their lower cost and technical advantages
- Technical advantages of BCTMP for end products.

Of the 20+ market BCTMP mills either in production, under construction, or in the detailed engineering phase, more than 90% of the tonnage (representing more than 2.5 million tpy) has already come online or will be coming online by the end of 1990. As of early 1989, a shortage exists not only of fully bleached chemical pulp but also of current third-generation-technology, high-quality BCTMP. Generation differences will be discussed later in this article.

BCTMP is defined in this article as pulp produced from mild chemically treated chips, bleached with peroxide, and having a total yield of 90+%. S-Pulp refers to a similar process with a patented chip "explosion device" ahead of refining and a yield in excess of 87%. Chemimechanical pulp (CMP) describes high-level, chemically treated chips that produce a pulp with a yield of 85+%. Figure 1 relates BCTMP to other types of pulp in terms of yield.

Early predictions of end uses for the various high-yield market pulp products have proved valid, and the list is growing considerably. Unbleached and commodity grades of market high-yield pulp have also played a role in the marketplace.

In addition to BCTMP, some market stone groundwood (SGW) is available; in the future, market pressurized groundwood (PGW) may be available, but this remains to be seen. In general, however, SGW, PGW, and thermomechanical pulp (TMP) will remain integrated within a multi-furnish mill complex.

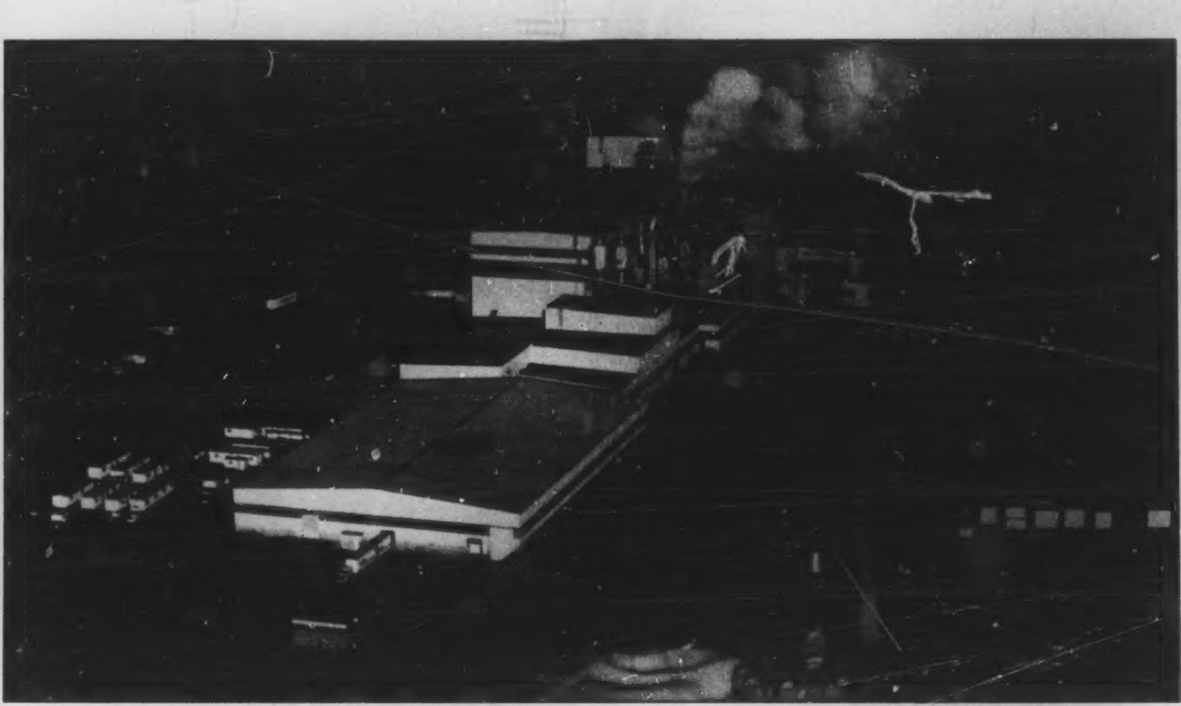
The predecessors, market refiner mechanical pulp

FIGURE 1: **Where BCTMP fits into the world's paper-grade pulps.**

	Pulp		Yield (%)
Pure mechanical	SGW — stone groundwood		95 to 97
	RMP — refiner mechanical pulp		94 to 96
	PGW — pressurized groundwood		94 to 95
	TMP — thermomechanical pulp		91 to 94
The shrinking gap	CTMP — chemi-thermomechanical pulp		90 to 92
	S-Pulp — explosion		86 to 90
	CMP — chemimechanical pulp		85 to 90
	V/UHYS — very/ultra-high-yield sulfite		75 to 85
	SC — semichemical		65 to 85
	HYS — high-yield sulfite		55 to 75
True chemical	NSAQ — neutral sulfite anthraquinone		50 to 65
	— — soda anthraquinone		52 to 55
	— — alcell/organosolv		50 to 60
	SP — sulfite pulp		45 to 53
	KP — kraft (sulfate) pulp		42 to 50

Mr. Sharman is vice president, Nystrom, Lee, Kobayashi Inc., Montreal, Que.

NOTE: All figures in this report are in metric tons.



Total nominal capacity of market BCTMP mills now operating, under construction, or currently on the drawing board totals some 2.75 million air-dry metric tpy (photo of Millar Western, Alberta, Canada, mill).

(RMP) and TMP mills, have disappeared, having either been shut down due to low quality or high cost, forward integrated into paper mills, or converted to BCTMP mills. Some TMP plants (both market and integrated) were, in fact, taken out of service and dismantled prior to technology being available for conversion to BCTMP. Examples include the following:

- Weyerhaeuser Paper Co., Everett, Wash.: fluff pulp
- Continental Forest, Augusta, Ga.: board
- Boise Cascade Corp., Rumford, Maine: lightweight coated (LWC)
- Gota, Sweden: market pulp.

CURRENT, POTENTIAL MILL STATUS. The Table 1 listing of current BCTMP suppliers includes mills now in operation, under construction, or on the drawing board as of the end of first-quarter 1989. Nominal production capacities are based on the higher-freeness grades.

The original BCTMP mills were built in Sweden for the domestic Nordic and European market to supply nonintegrated mills within a captive market. The trend to forward integration in Scandinavia, coupled with inherent high power costs, probably will make the construction of new market BCTMP mills in that part of the world unattractive. However, two or three mills possibly will be built in other parts of Europe.

The majority of the more modern mills (1986 to present) have been, and will continue to be, built in Canada because of lower energy costs and proximity to supplies of desirable wood species. This growth trend will be maintained until all available wood has been committed. Hardwoods, especially aspen, are also being vigorously sought by those looking to expand or construct bleached kraft pulp mills.

Another major geographical area for potential new market BCTMP mills is South America. Again, lower manufacturing costs and desirable wood species, such as eucalyptus and radiata pine, enhance this possibility.

Long-range potential for development, in addition to North and South America, exists in Australia and New Zealand. As in South America, technology has opened the door to this part of the world with its eucalyptus and radiata pine species. Winstone, New Zealand, has already operated for several years with a furnish of radiata pine.

The southern pines of the southeast U.S. may provide future potential with continued advancements in technology. Celulosa y Papel, Mexico, will be one of the proving grounds for pine species; it utilizes the higher-pitch-containing ponderosa pine for several grades.

End-product utilization will be limited for a number of years for pulps from a majority of pine species until, as suggested previously, further strides are made in process technology. However, it is important to remember that only a few years ago, 100% southern pine newsprint was not believed feasible.

TABLE 1: **Current world market BCTMP mills.**

Company/location	Mill startup year	Nominal production a.d. tpy	Mill status early 1990	Number of refiner lines	Number of refining stages	Process technology generation	Pulp dryer type	Predominant wood species	Principal end products	Product principal markets
Rockhammars Bruk, Sweden[1]	1978	50,000	Operating	1	2	2	Flash	Spruce/aspen	P&W/B/T/F	E
Billerud, Sweden[2]	1981	35,000	Operating	1	1	1	Airborne	Spruce	F	E
SCA, Sweden	1982	65,000	Operating	2	1	1	Flash	Spruce	T/F	E/C
Melhoramentos, Brazil	1982	10,000	Operating	1	2	1	Wet lap	Eucalyptus/pines (mixed)	P&W/T	SA/C
Quesnel River, British Columbia[1,2]	1982	90,000	Operating	1	2	2	Flash	Spruce/pine (lodgepole)	P&W/T/F	NA/A
Winstone, New Zealand[1,6]	1983	85,000	Operating	2	2	1	Flash	Pine (radiata)	P&W/B/T	A
Opua, Spain[6]	1983	50,000	Noncontinuous	2	2	1	Flash	Pine (radiata)	Newsprint	E
Folla, Norway	1984	80,000	Operating	2	2	1	Flash	Spruce/aspen	P&W/B/T/F	E
Rottneros, Sweden[1]	1984	60,000	Operating	1	2	2	Flash	Spruce/aspen	P&W/T	E/A
Modo/Iggesund, Sweden	1985	75,000	Operating	1	1	1	Airborne	Spruce	B/T/F	E/C
Serlachius, Finland	1985	70,000	Operating	2	1	1	Airborne	Spruce/aspen	B/T/F	E/C
Temcell, Quebec[3]	1986	95,000	Operating	1	2	2	Flash	Aspen/spruce	P&W/B/T/F	NA/A
Cascades, Quebec[3]	1987	165,000	Operating	3	2	2	Can	Spruce	P&W/T/F	NA/E/A
Celulosa y Papel, Mexico[6]	1987	80,000	Operating	1	2	1	Flash	Pine (ponderosa)	T	NA
Caxton, New Zealand	1987	90,000	Operating	1	2	1	Airborne	Pine (radiata)	P&W/B/T	A/C
Millar Western, Alberta	1988	210,000	Operating	2[4]	2	3	Flash	Spruce/pine (lodgepole)/aspen	P&W/B/T	NA/E/A
Fibreco, British Columbia	1988	180,000	Operating	2[4]	2	3	Flash	Spruce/pine (lodgepole)	P&W/B/T	NA/E/A
Quesnel River, British Columbia	1988	105,000	Operating	1	2	3	Flash	Spruce/aspen	P&W/B/T	NA/A
Vaggeryd Cell, Sweden	1989	70,000	Operating	1	2	2	Flash	Spruce	P&W/B/T/F	E
Cascades, Quebec[3]	1989	100,000	Operating	1	2[5]	2	Can	Spruce	P&W/T/F	NA/E/A
Consolidated-Bathurst, New Brunswick[2]	1989	90,000	Operational	1[4]	2	3	Flash	Spruce/balsam	P&W/B/T	NA/E
Donohue, Quebec	1990	190,000	Construction	4[4]	2	3	Flash	Spruce/balsam	P&W/T/F	NA/E
Celulosa y Paper, Mexico[3,6]	1990	80,000	Construction	1	2	2	Wet lap	Pine (ponderosa)	P&W	NA/C
Alberta Energy, Alberta	1990	120,000	Design	1	3	3	Flash	Aspen/spruce	P&W	NA/A
Nortek, Saskatchewan[7]	1990	100,000	Design	1	2	3	Flash	Aspen	P&W/B/T	NA/E/A
Millar Western, Saskatchewan	1991	240,000	Design	2[4]	2	3	Flash	Aspen	P&W/B/T	NA/E/A
Louisiana-Pacific, British Columbia	1991	170,000	Design	2	2	3	Flash	Aspen	P&W/T	NA/A
	TOTAL	**2,750,000**								

1. Converted from TMP.
2. Mill has one additional captive line.
3. Percentage captive in future.
4. Interline fiber fractionation.
5. Single refiner—two stages.
6. Some unbleached.
7. S-Pulp (exploded process).

LEGEND:

P&W = Printing/writing
B = Paperboard
T = Towel/tissue
F = Fluff

NA = North America
SA = South America
E = Europe
A = Asia

C = Some captive

Figure 2 shows current world wood species by country for present and planned market BCTMP mills. Table 2 lists market BCTMP mills and expansions being planned as of early 1989.

It is interesting to note that both Tables 1 and 2 include new companies and investors—previously unknown in the industry, who have embarked on ventures in this relatively new market pulp. It is probable that some of these market BCTMP plants will forward integrate within the next few years, especially those strictly

TABLE 2: **Potential world market BCTMP mills (planned/announced) to end of first-quarter 1989.**

Company/location	Nominal production a.d. tpy	Predominant wood species
Temcell,[1] Quebec, Canada	120,000	Aspen/spruce
San Augustine,[2] Texas, U.S.	190,000	Pine (southern)
Battistella,[2] Brazil	100,000	Pine (loblolly)
Confidential, (Taiwan), Alberta, Canada	240,000	Aspen/spruce
SPBBS,[3] Quebec, Canada	100,000	Aspen/spruce
Celulosa, Santa Monica, Argentina	75,000	Pines (ponderosa/lodgepole)
Confidential, Mississippi, U.S.	200,000	Pine (southern)
Crossen, German Dem. Rep.	60,000	Spruce/aspen/pine (scotch)
Serlachius, Finland	25,000	Spruce/aspen
Fibreco,[2] British Columbia, Canada	180,000	Aspen/spruce
Papel Misionero, Argentina	30,000	Eucalyptus (grandis)
Essex, Labrador, Canada	180,000	Spruce
SCA, Sweden	65,000	Spruce
Shinho (Korea), Ontario, Canada	120,000	Aspen
Winstone, New Zealand	55,000	Pine (radiata)
Confidential, (People's Rep. China) Ontario, Canada	100,000	Aspen
Suzano/CVRD, Brazil	30,000	Pine (Caribbean)/eucalyptus (mixed)
Confidential,[3] West Virginia, U.S.	100,000	Poplar (yellow)
Confidential, Chile	100,000	Pine (radiata)
Confidential,[3] New York, U.S.	100,000	Aspen
Consolidated-Bathurst/Massuh,[2] Argentina	100,000	Eucalyptus (grandis)
Confidential,[3] Thailand	50,000	Eucalyptus
Confidential,[3] Nova Scotia, Canada	100,000	Aspen/mixed hardwoods
Confidential,[4] Norway	40,000	Spruce/aspen
Confidential, California, U.S.	100,000	Eucalyptus (grandis)
Confidential, Arkansas, U.S.	175,000	Pine (southern)
Andinos, Chile	100,000	Pine (radiata)
Cascades, Quebec, Canada	120,000	Aspen/spruce
Asitka, British Columbia, Canada	250,000	Mixed softwoods
Confidential, British Columbia, Canada	200,000	Spruce/aspen
TOTAL	**3,405,000**	

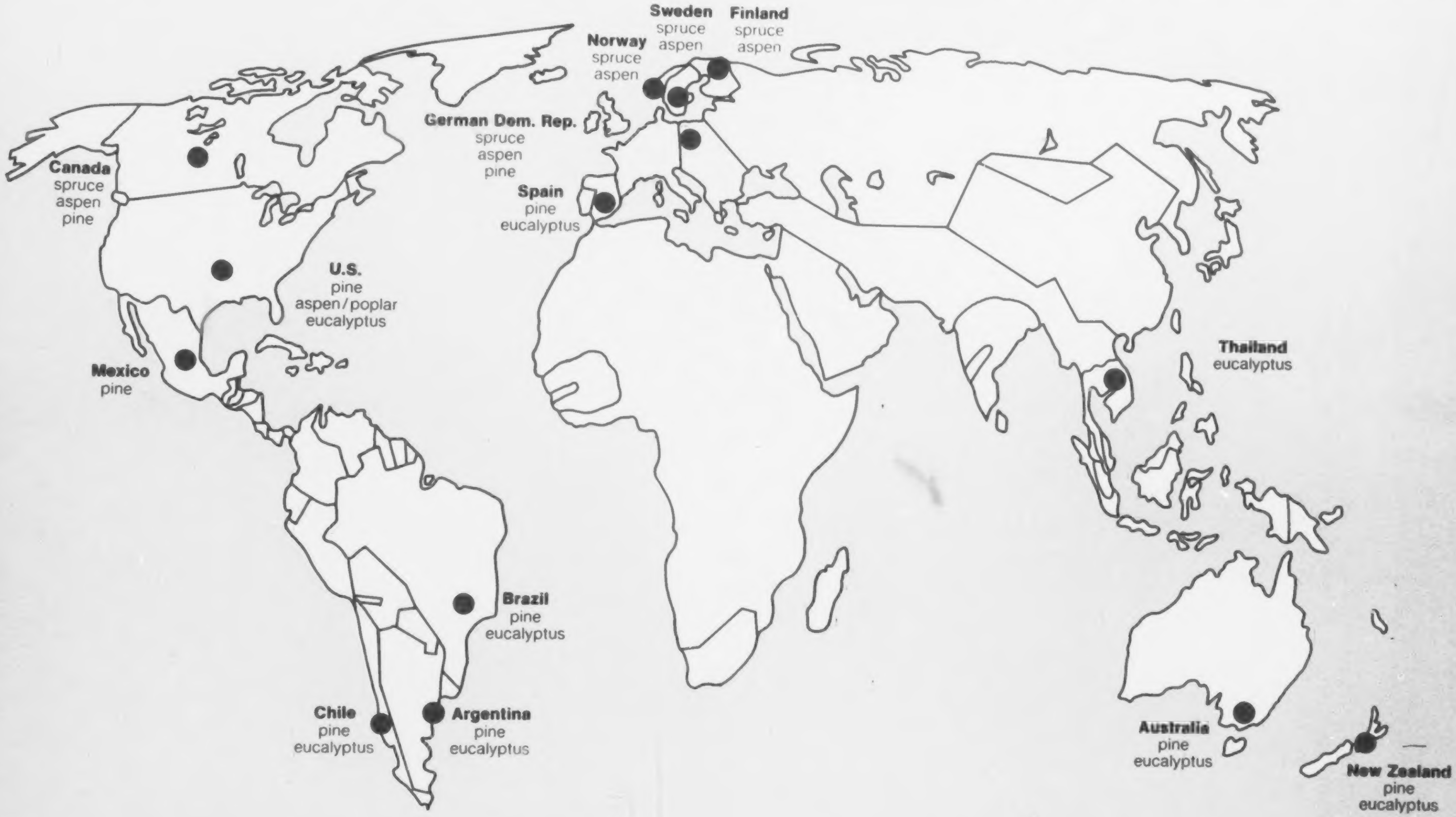
1. Additional possibility with St. Raymond Paper, Quebec. 2. Forward integration in near future. 3. S-Pulp mill (exploded pulp process). 4. Conversion to CTMP.

TABLE 3: **World paper-grade pulp capacity, market and integrated (softwood and hardwood, 000 tons).**

Pulp	1987	1988	1989	1990	1991	1992	Average growth 1987–92
Bleached kraft	58,270*	59,650	61,370	64,400	65,860	67,350	2.6%
Unbleached kraft	38,730*	38,820	38,770	38,790	39,110	39,110	0.2%
Sulfite	10,710	10,490*	10,620	10,490	10,490	10,490	−0.3%
Other chemical, including semichemical	24,460*	24,500	24,540	24,780	24,780	24,780	0.2%
CMP/ (B) CTMP	5,050*	6,000	6,740	7,250	7,490	7,590	8.4%
SGW/PGW/RMP/TMP	33,950*	35,270	37,010	37,950	38,240	38,400	2.2%
World total	171,170	174,730	179,050	183,660	185,970	187,720	
Annual growth rate		2.1%	2.5%	2.6%	1.3%	1%	1.6%

Source: Celpap
(except *: FAO)

FIGURE 2: **World market BCTMP mills, current and planned.**


Canada
spruce
aspen
pine
U.S.
pine
aspen/poplar
eucalyptus
Mexico
pine
German Dem. Rep.
spruce
aspen
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Norway
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Sweden
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utilizing softwoods.

Table 3 outlines world paper-grade pulp capacity for both market and integrated mills. BCTMP capacity, since it came on the world market and projected to 1992, is shown in Figure 3. Current and potential world market BCTMP capacity by region is shown in Figure 4. The world's total paper-grade market pulp capacity (history and immediate forecast) is shown in Table 4. Table 5 summarizes the history and immediate forecast for the world's various high-yield pulp utilization, both market and integrated.

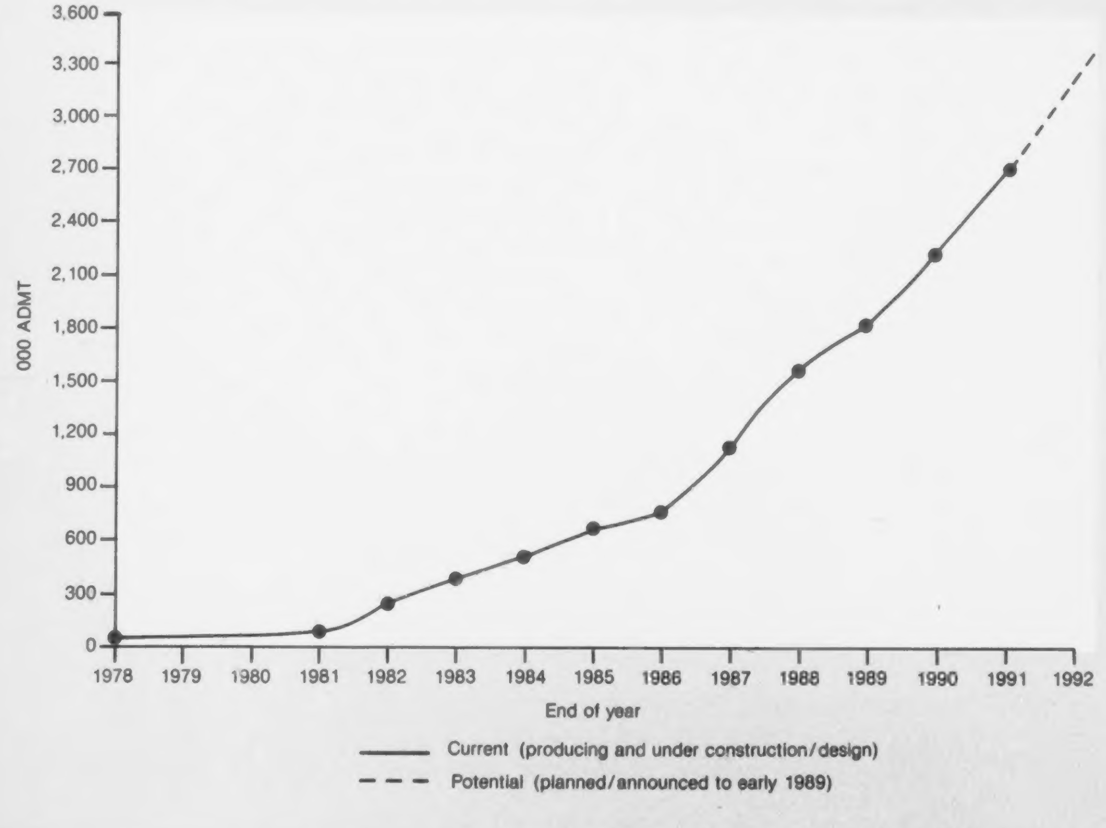
END USES. The early BCTMP mills provided the limited market of chemical pulp replacement for towel, fluff, and certain lower-quality tissue grades. Opportunities in this market have become diluted with the in-

TABLE 4: **World paper-grade pulp capacity history and forecast (softwood and hardwood).**

Pulps	**End of year** **1985**		**1986**		**1987**		**1988**		**1989**		**1990**		**1991**		**1992**	
	%	**a.d. tpy (000)**	**%**	**a.d. tpy (000)**	**%**	**a.d. tpy (000)**	**%**	**a.d. tpy (000)**	**%**	**a.d. tpy (000)**	**%**	**a.d. tpy (000)**	**%**	**a.d. tpy (000)**	**%**	**a.d. tpy (000)**
(B) CTMP	2	670	3	770	4	1,010	6	1,570	7	1,830	8	2,220	9	2,700	10	3,300
(B) SGW	4	800	3	750	3	700	3	650	2	650	2	600	2	550	2	550
Bleached kraft	94	22,500	94	22,500	93	23,200	91	23,500	91	24,600	90	26,400	89	27,800	88	29,100

Source: Celpap. All tons are metric.

FIGURE 3: **World market BCTMP capacity history and forecast.**



creased capacity during recent years. Paperboard, including liquid packaging, has generally been in a captive market to date.

The future growth in utilization of market BCTMP lies in the displacement of other types of pulp in existing products and in the creation of new end products. To promote growth in the utilization of existing grades and to achieve a larger percentage of the product in new grades, certain quality criteria will have to be met. In addition to the desirable technical advantages of BCTMP, several unacceptable pulp properties must be *consistently* eliminated. Some of these are summarized in Table 6.

Key factors that will encourage further utilization include the following:

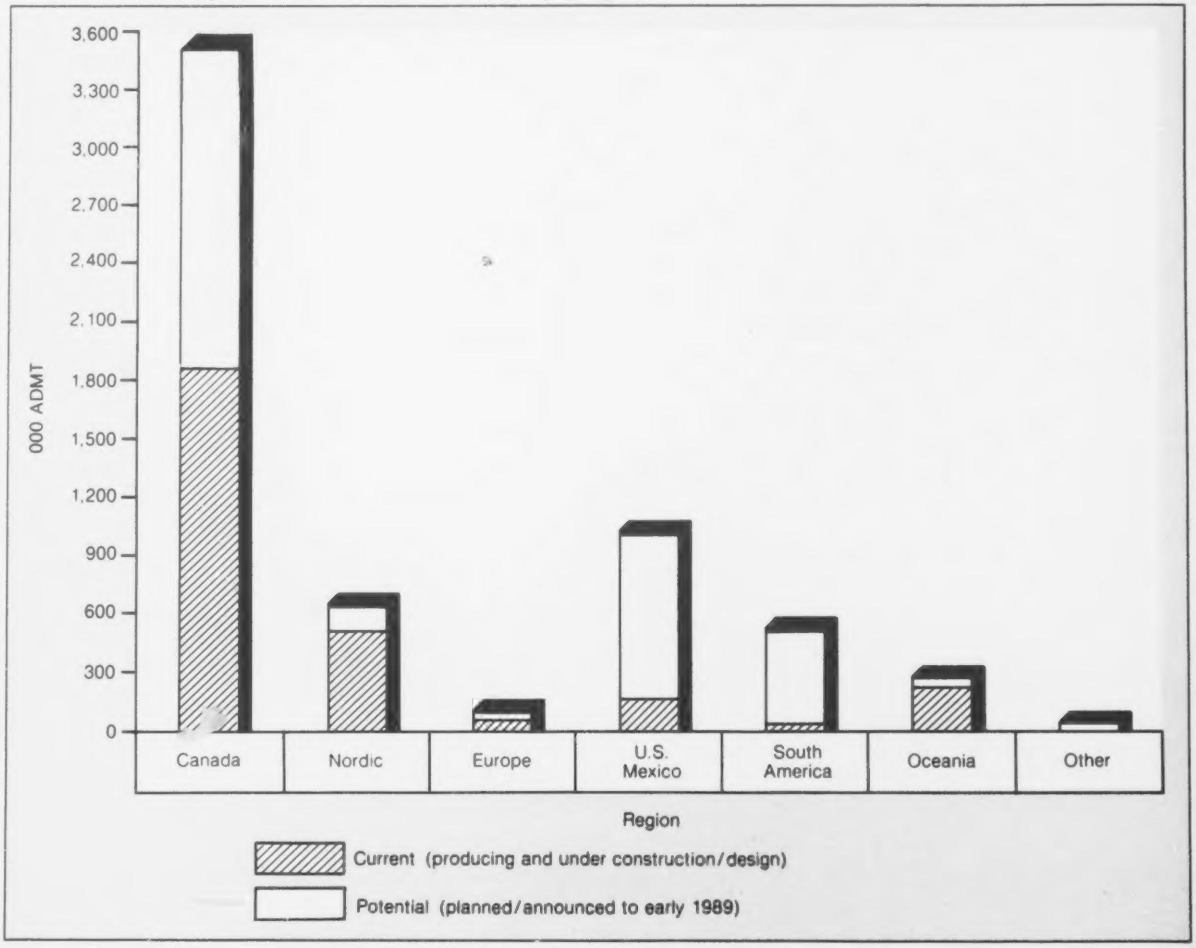
- Uniformity of quality
- Higher freeness/better runability
- Higher brightness
- Lower reversion
- Lower extractive levels
- Proper marketing
- Wood-free grade definition that allows performance basis, not furnish.

TABLE 5: **World high-yield pulp use, market and integrated.**

	000 a.d. metric tpy				
Pulp	**1979**	**1984**	**1989**	**1992***	**Future trend**
(B) SGW/RMP	24,200	15,700	13,700	12,500	Declining (integrated and market)
PGW/ (B) TMP	4,900	10,200	13,700	16,400	Increasing (integrated)
(B) CTMP/ (B) CMP	800	3,200	6,400	7,200	Increasing (integrated and market)

Sources: Ekono/PPI.
*Celpap.

FIGURE 4: **Current and potential world market BCTMP capacity by region.**



The world trend in market pulps is toward hardwood grades, which are characterized by short, fine fibers. Eucalyptus chemical pulps (once considered as a filler) have paved the way toward the use of shorter-fiber pulps to enhance product quality; strength is sacrificed to gain other advantages, such as better formation and printability or improved softness. Hardwood BCTMP has shown similar attributes when compared with softwood BCTMP. In addition, hardwood BCTMP displays superior bleached brightness and lower reversion.

Because of the technical advantages of hardwood BCTMP compared with softwood BCTMP, northern paper producers will move to higher-value grades containing hardwood BCTMP. Softwood grades will be used to a greater extent as a reinforcement component and in products requiring high bulk.

As pulp strength and shive levels improve, it is becoming possible to manufacture higher-freeness pulps for a given end-product application. Such increases in pulp freeness lead to improved drainage and, consequently, better paper machine runability for lower-freeness grades.

Brightnesses of 85+% ISO are achievable with certain species at economical chemical consumptions. But these higher brightnesses are not required for many products, especially when lower substitution percentages of BCTMP apply. Most North American printing paper is produced in the 82% to 88% ISO range. Reversion, cleanliness, and extractive levels are often more important; these have been improved drastically as a result of evolution of technology. Requirements such as repulpability, absorbency, taste/smell elimination, and fines level reduction have also all improved considerably with technology advancements. These attributes have recently brought softwood BCTMP into use for diaper manufacture in Europe; the marketing program exploits the dioxin in chemical pulps issue.

The industry is getting closer to the entry of BCTMP into higher-quality grades of tissue. Current BCTMP, especially softwood, offers good bulk, and this is one factor. However, softness is an essential requirement. The best tactile (touch) softness is currently achieved with debonded eucalyptus chemical pulp. Hardwood (aspen/eucalyptus) BCTMP is better than softwood BCTMP in this regard, and continuing technology development will lead to further improvements, resulting in wider application of BCTMP for tissue and towel grades.

BCTMP has both advantages and disadvantages when compared with chemical pulps in producing absorbent grades of paper products. The relative stiffness and bulk of CTMP, especially after wetting, provides increased absorbent capacity in a tissue, towel, or napkin. However, the presence of minute quantities of wood resins (the amount of which varies by wood species) or other fatty chemicals in the pulp inhibits the rate of absorbency in the final product. The relative importance of absorbent capacity vs rate varies by product and can be significantly influenced by paper structure as well. Good pulp washing, bleaching, and chemical treatments tailored to different wood species are necessary. Of the wood species used for absorbent pulp applications, northern spruce BCTMP has been the most successful.

The gap between newsprint, specialties (LWC), medium-weight coated (MWC), and supercalendered grades is

TABLE 6: **BCTMP end-use property requirements.**

	BCTMP properties	
Grade	**Acceptable**	**Unacceptable**
Printing and writing	High bulk High stiffness High opacity High surface strength Good formation Good printability	High shives Poor runability High reversion Surface roughness High dusting/linting Poor dimensional stability
Paperboard	High bulk High stiffness Good printability Low shives	High extractives Poor runability Low ply bond Taste/odor
Towel	High bulk High absorbency High brightness Hardwood improves softness	High shives Poor runability High fines (dust) High extractives
Tissue	High absorbency High brightness Low silicate content Hardwood improves softness	High shives/coarseness Poor runability High fines (dust) High extractives
Fluff	High bulk High absorbency (rate and capacity) High brightness	High shives High fines (dust) High reversion (yellowing)

shrinking due, in part, to improved high-yield pulp quality. Newsprint is largely a specialty grade now, or is becoming so, even in areas where wood quality is poor. This has arisen from the need for high-quality, four-color printing. High-quality market BCTMP will satisfy the requirements of certain higher-value grades, both when "today's specification" pulp enters the market and when those few paper producers and end users fully realize the advantages. Then the printing and writing rush will begin.

It is widely agreed that the largest potential market for BCTMP grades is in this area of certain printing and writing paper. In addition to conventional high-yield-pulp-containing paper, such as LWC, the immediate possibility is for commercial grades, such as business forms, computer listings, and copy paper, along with some book paper and several general printing paper applications. Technology will soon solve such concerns as heat curl and dusting. A greater opacity will be required for double-sided copy machines. The current "wood-free rule" (i.e., a maximum of 10% mechanical pulp to qualify as a "free" sheet) clearly poses a marketing barrier to penetration of BCTMP in the printing and writing paper sector. With the advent of high-quality, high-yield pulps now available in significant quantities, and in spite of resistance in the industry, new grades will evolve to accommodate increasing supplies of BCTMP, regardless of this rule.

Pressure to drop this will come from nonintegrated papermakers, who will use increasing quantities of BCTMP to lower furnish costs. It is likely that they will develop specific intermediate grades of paper with their own brand names to circumvent this definition. Similarly, pressure to utilize more secondary fiber in paper will encourage modification of the rule due to the difficulty in controlling the quality of the wastepaper. It is hoped that the industry soon will eliminate such terms as "slightly wood-free" or "part mechanical."

Table 7 indicates world market BCTMP consumption percentages by grade and region. Estimated world consumption tonnages and percentages by grade from 1984 and forecast to 1992 are shown in Table 8. The approximate supply and demand balance for market BCTMP is shown in Table 9.

The current world CTMP (i.e., bleached and unbleached) major product end usage is shown in Table 10. It clearly indicates high growth over the short time period during which significant quantities of high-quality BCTMP have been available.

Due to declining landfill site availability in certain parts of the world and the depletion of accessible forest resources, legislation is increasing regarding biodegradables and recycling. In the near future, many products made with only virgin fiber will be taxed accordingly.

New secondary-fiber process technology is targeting use in higher-value products; one example is improved peroxide bleaching for recycled fiber. Competition from secondary fiber as an alternate replacement for chemical pulps is strong.

In the longer term, increased pressure to use recycled fiber will reduce secondary fiber raw material quality. This will result from an increased average number of recycles and the recycling of lower-quality products. As this happens, BCTMP will become an attractive reinforc-

TABLE 7: **Estimated world market (B)CTMP consumption by grade and region.**

Grade	**Europe (EC)**		**Nordic**		**North America**		**South America**		**Asia/Oceania/ other**	
	1987	**1992**	**1987**	**1992**	**1987**	**1992**	**1987**	**1992**	**1987**	**1992**
Printing and writing	46%	78%	23%	29%	26%	61%	35%	50%	20%	26%
Newsprint/specialties	8%	1%	0%	0%	0%	2%	0%	0%	60%	50%
Paperboard	2%	1%	15%	9%	0%	0%	15%	10%	5%	5%
Towel/tissue	28%	14%	15%	17%	74%	37%	50%	40%	15%	16%
Fluff	16%	6%	47%	45%	0%	0%	0%	0%	0%	3%
000 tons	245	840	65	90	95	410	20	50	205	310

Source: Celpap.

TABLE 8: **Estimated world market (B)CTMP consumption by grade (total tonnage and percentages).**

	1984		**1987**		**1988**		**1992**	
Grade	000 tons	%	000 tons	%	000 tons	%	000 tons	%
Printing and writing	50	10	200	32	265	33	1,030	61
Newsprint/specialties	265	50	140	22	180	22	170	10
Paperboard	50	10	30	5	35	5	40	2
Towel/tissue	130	25	190	30	240	30	360	21
Fluff	25	5	70	11	80	10	100	6
Totals	**520**	**100**	**630**	**100**	**800**	**100**	**1,700**	**100**

Source: Celpap.

ing pulp component for certain products due to its low cost and compatibility with recycled fiber.

An additional increase in utilization of lower-cost pulps, including both recycled fiber and BCTMP, will result from replacement of nonbiodegradables, such as plastic and Styrofoam containers for packaging. The fast-food industry is a good example. Several companies have announced the discontinuation of products containing chlorofluorocarbons (CFC), sparked primarily by the thinning ozone layer issue. CTMP and secondary fiber will be the natural furnishes to resolve many of these concerns.

MARKET AREAS. Europe has long been established as the major current market for BCTMP, although tonnage is small compared with other furnishes. There are a few examples of backward integration to BCTMP after companies had used the purchase of market BCTMP as their pilot plant since BCTMP is sold as a tailor-made pulp. Europe will be supplied with more capacity from North America and, eventually, South America as available Scandinavian tonnage declines due to forward integration of their BCTMP mills.

The North American market is growing slowly for three main reasons:

1. The lack of significant quantities of available high-quality BCTMP
2. Resistance in the printing and writing sector, discussed previously, vs the saturation of the towel/sanitary tissue market
3. The comparatively low amount of recycled fiber used to date.

This year will prove the potential and set the trends for the future in the printing and writing sector because of the availability of high-quality pulp now entering the market.

Asia has been an increasingly active purchaser of BCTMP. Again, due to the lack of high-quality market pulp to date, Japan has been the slowest region to react to the entry of BCTMP into some of its higher-quality products.

Market proximity has not, as yet, been a key factor. This will change if, and when, more market BCTMP mills are built in the southeast U.S., South America, and Oceania, for example. Table 1 indicates the predominant market areas for the current mills.

The differences in market requirements for various geographical areas can be indicated by some printing and writing trends in three market regions:

- Europe—favors brightness/smoothness

TABLE 9: **Approximate supply/demand balance for world market (B)CTMP.**

			000 tons			
Item	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**
A. Installed capacity (average)	940	1,480	1,700	1,890	2,070	2,070
B. Available capacity	700	850	1,470	1,700	1,880	2,070
C. Consumption	630	800	980	1,180	1,400	1,700
D. Utilization rate (C/B)	90%	94%	67%	69%	74%	82%

Captive market tonnages excluded.
Source: Calpap.

TABLE 10: **Major end-product world (B)CTMP usage (early 1989—top end of quality).**

Printing and writing	**% (B)CTMP**	**Board**	**% (B)CTMP**	**Tissues**	**% (B)CTMP**	**Fluff**	**% (B)CTMP**
Newsprint/specialties	100	Boxboard	50	Toweling	50	Diapers	100
Magazines	65	Foodboard	50	Sanitary	60	Sanitary pads	100
LWC/MWC	65	Liquid packaging	50	Facial	0		
SC	80	Linerboard	35	Filter	90		
Pocket book	100	Folders	70				
Reproduction (copy)	80	Chipboard	15				
Computer (listing)	50	Molded products	50				
Business forms	40						
Hardcover books (fiction)	40						
Reply card	60						
30 to 250		200 to 400		350 to 550		550 to 650	

Freeness ranges (CSF)

Percent is of fiber content.
Hardwood BCTMP % is lower for board and printing and writing grades.

- North America—favors opacity/strength
- Japan—favors opacity/smoothness/strength.

In the case of diapers, use of BCTMP has been successfully promoted to consumers in Scandinavia and Europe as a dioxin-free pulp. However, since the advent of consumer-preferred, superabsorbent-containing, thin diapers, the importance and quantity of woodpulps used in this application have declined significantly. Dioxin concerns may result in some increased use of highest-quality BCTMP in diapers in North America. Longer term, diapers may not be the promising market envisioned.

WOOD SPECIES AND PULP PROPERTIES. Woodfiber morphology and resin content for the predominant wood species used currently and planned for BCTMP are indicated in Table 11. The following are generally true:

- Long fiber length equals high tear but low printability and poorer formation.
- Short fiber length equals good paper smoothness and opacity but low tear.
- Small fiber diameter equals improved printability, opacity, and softness.
- Large fiber diameter equals high bulk but reduced smoothness and printability.
- Thick fiber wall equals lower tensile, higher linting, and reduced smoothness.
- High nonfiber content (vessel ray cell) equals higher linting and dusting.
- High wood density equals high energy requirements, with high chemical applications required.
- High extractives equals low brightness, high reversion, poor bonding, and poor absorbency.

The early, higher-quality BCTMP mills, especially in Scandinavia, used spruce as the raw material. Product qualities from early mills that used higher percentages of pine species were poorer. Better processing techniques have helped to improve pulp quality from all softwood species, especially the higher-resin-containing pines.

The use of low-density hardwoods, in general, requires a fine balance between the strength, brightness, and opacity requirements and the energy and chemical input. Higher-density hardwoods, such as birch and beech, will necessitate a lower yield for given pulp qualities.

Currently, the use of aspen and eucalyptus BCTMP has considerable promise for inclusion in printing and catalog paper. The higher bulk (lower density) of BCTMP-containing sheets provides more printing surface per ton of pulp. The enormously increased number of finer, shorter fibers per gram results in finished paper that is smoother, more uniform, more opaque, and less porous than wood-free paper made from chemical pulps.

Aspen and, in the future, eucalyptus command a premium price due to higher brightness and lower reversion levels as well as better paper smoothness, printability, and, in the case of tissue, better softness than BCTMP from softwoods. Hence, the North American and South American market potential due to the relatively large abundance of aspen and eucalyptus, respectively, is substantial. Oceania will also provide eucalyptus-grade BCTMP in the future. In addition to these advantages, eucalyptus is an attractive plantation species since its short growing cycle can keep the harvest area close to

TABLE 11: **World market BCTMP mills: typical wood morphology and resin characteristics.**

Species	Fiber length (mm)	Fiber diameter (μm)	Wall thickness (μm)	Wood density (kg/m^3)	Alcohol-benzene extractives (%)
Softwoods					
Spruce—black (Canada)	3.5	25-30	2.2	400	2.2
Spruce—white (Canada)	3.3	25-30	2.4	368	2.0
Balsam fir (Canada)	3.5	30-35	2.5	340	2.5
Pine—ponderosa (Mexico)	3.6	35-45	3.4[1]	384	4.0-5.0[2]
Pine—lodgepole (Canada)	3.1	35-45	3.0	384	3.5
Pine—loblolly (southern U.S.)	3.6	35-45	3.5[1]	425	3.5-4.5[2]
Pine—radiata (Chile) *	4.0	35-45	variable	400	2.5
Pine—radiata (Oceania) *	3.5	30-45	variable	400	2.2
Hardwoods					
Aspen—trembling (Canada)	0.9	10-27	2.5	355	1.5
Eucalyptus—grandis (Argentina) *	0.8	17	2.9	440	1.3
Eucalyptus—saligna (Brazil) *	0.9	21	3.5	450	1.8
Eucalyptus—regnans (Australia) *	0.9	17	3.1	420	1.7

General: Because of the difficulty in generating a uniform, reliable database, these data are presented as typical only and are not definitive for any particular wood supply or species. The value of this information is that it shows the relative advantage that BCTMP producers have based on their wood resources.

1. Pine fiber wall thickness varies widely between early wood and late wood. These are average values.
2. Extractives content for these two species varies with growing conditions (climate, tree age, soil characteristics).

Source: Isenberg/Foelkel & Barrichelo
(except *).

the mill location.

The radiata pines of South America, especially in Chile, and Oceania will become a major potential BCTMP species due to their high brightness and high tear. Current technology has raised and maintained quality considerably over the current mills utilizing this wood, although end products are still limited. Caribbean pine will be utilized in Venezuela to produce BCTMP for use in tissue grades (integrated).

Currently, interest in southern pine BCTMP is being renewed for the large domestic market in the southeast U.S. Again, technology is at a point that makes this viable (with brightnesses of 80% ISO obtainable at an economical cost), compared with even five years ago, when southern pine or ponderosa pine BCTMP potential was considered low.

Technology has advanced to the point that in the very near future, countries in parts of Africa and Asia will be building BCTMP plants using a variety of their wood species, particularly hardwoods.

Tables 1 and 2 indicate the predominant wood species for current and planned market mills. Figure 2 shows them by country. A typical comparison between the properties of a softwood and hardwood kraft, a softwood and hardwood BCTMP, and a hardwood S-Pulp is shown in Table 12.

It should be noted that extractive percentage is a crude and misleading figure since the crucial chemistry of the measured extractives varies by wood species and pulping chemistry/process. For example, 0.1% for spruce CTMP is not nearly as good as 0.1% for softwood or hardwood kraft for absorbent grades of pulp. End product use of pulp determines the acceptable figures.

The typical properties for BCTMP utilizing different softwood and hardwood species are indicated in Table 13. A BCTMP-containing paper property comparison with wood-free-grade printing and writing paper is shown in Table 14. The impact of using softwood and hardwood BCTMP in fine paper compared with softwood and hardwood kraft is shown in Table 15.

TABLE 12: **Typical pulp property comparison between BCTMP and chemical pulps.**

Property	**Unit**	**BCTMP**		**S-Pulp**[1]	**Hardwood kraft**	**BCTMP**		**Softwood kraft**
Species	—	**75% aspen/ 25% spruce**		**Aspen**	**Aspen**	**Spruce**		**Spruce**
Freeness, CSF	ml	100	400	240	400	100	400	400
Tensile index	Nm/g	65	50	77	75	67	48	120
Tear index	mN.m^2/g	6.0	7.0	6.5	9.0	8.0	9.0	10.7
Burst index	kPa.m^2/g	2.7	2.2	5.0	4.6	3.4	2.7	10
Bulk	cm^3/g	1.9	2.2	1.6	1.5	2.1	2.8	1.3
Yield	%	89	89	87	50	91	93	43
Brightness, ISO	%	85	85	85	90	80	82	90
Opacity	%	78	71	70	71	82	79	65
Classification:								
+28	%	8	16	10	20	40	55	70
−200	%	22	20	14	10	24	16	8
Shives (Sommerville)	%	0.02	0.05	0.15	0	0.02	0.05	0

1. Unscreened—trial.

TABLE 13: **Typical BCTMP properties of various wood species.**

Property	**Unit**	**Softwoods**				**Hardwoods**	
Species	—	**Black spruce**	**Southern pine**	**Ponderosa pine**	**Radiata pine**	**Aspen (trembling)**	**Eucalyptis (grandis)**
Freeness, CSF	ml	400	400	380	400	110	125
Tensile index	Nm/g	48	30	32	44	50	52
Tear index	mN.m^2/g	9.0	11.0	10.0	10.6	5.0	4.8
Bulk	cm^3/g	2.8	3.6	3.3	2.9	1.8	2.1
DCM extractives	% (maximum)	0.10	0.12	0.11	0.10	0.05	0.10
Yield	%	93	92	92	93	89	88
Brightness, ISO	%	82	76	76	79	85	80
Opacity	%	79	80	81	83	16	80
Classification:							
+28	%	55	50	50	58	8	13
−200	%	16	18	20	17	20	18
Shives (Sommerville)	%	0.10	0.08	0.12	0.08	0.05	0.06

TECHNOLOGY. With the evolution of market BCTMP technology, it has been possible to divide the mills into three generations, as shown in Table 1. First-generation mills resemble newsprint mills with a pulp dryer instead of a paper machine. Chip preparation equipment (i.e., ahead of refining) and bleach plant equipment typically are of a vintage that was available prior to 1980. The original mills now have been upgraded technically and/or are using percentages of hardwoods, which are, as previously mentioned, desirable species.

Second-generation mills are characterized by the latest in chip preparation equipment ahead of refining, modern bleaching capabilities, and fractionation when multiple refiner lines have been installed.

Current third-generation mills typically include such technological advances as multistage impregnation, process chemistry variations, sulfonated long-fiber processes, interstage washing and bleaching, and multistage, multi-chemical bleach plants. Multiple refiner lines allow optimization of all pulp grades. The most recent developments involve patented multistage impregnation of chips combined with patented pulping chemistry based on the alkaline peroxide process, leading to pulps with unique physical and optical properties, including fiber length distribution characterized by very low fines content.

Future fourth-generation mills will be simpler, more economic, single-product operations. Growth and acceptance of BCTMP makes it possible for some mills to focus on more limited grades rather than requiring highly flexible specialty pulp production. Use of sheet dryers instead of more flexible flash dryers is expected in some of these mills.

Design aspects of the chipping, chip screening, and chip preparation systems have been influenced by the goal of feeding the process with chips of uniform size, moisture content, temperature, and chemical concentration, as well as low resin content; these factors are known to influence pulp quality. For instance, a trend is being seen in modern chipping and chip screening systems to minimize chip fines generation while maximizing chip size uniformity.

Chipper knife protrusion is maximized, which favors production of more large chips and fewer fines. Chips are sent to a chip thickness screening system from which the overthick fraction is directed to a slicer. Since properly maintained slicers display lower fines generation than chippers, this practice leads to relatively fewer small chips and chip fines.

A trend is also emerging toward lower bark levels in chips, more efficient chip washwater recycle systems, and mill water usage strategies that recycle whitewater back through the chip washer. This trend is driven by the requirement for higher brightnesses and extremely low dirt content for grades used in personal hygiene products and fine paper. Purchased chip specifications have been tightened up considerably to allow consistently high-quality pulps to be manufactured.

TABLE 14: **Property comparison between BCTMP-containing and wood-free printing and writing paper.**

BCTMP Property	Comparison with wood-free grade	Property comments
Cleanliness	Similar	Solved by pulp mill technology
Strength	Similar	High tensile/low tear
Stiffness/bulk	Better	Enhanced effect in layered paper
Brightness	Lower	Marginal effect with hardwoods
Opacity	Better	Improved further by fractionation
Reversion	Problem	Less with hardwood, no standard measurement
Dusting/linting	Former problem	Improved by pulp mill technology
Roughness	Potential problem	Can be compensated by pulp mill technology
Shives	Potential problem	Can be compensated by pulp mill technology
Grammage	Lower	For same opacity/bulk and stiffness

TABLE 15: **Typical comparison between BCTMP-containing and wood-free fine paper.**

Furnish/property	Unit	BCTMP	BCTMP	Chemical
Eucalyptus BCTMP	%	90	—	—
Aspen BCTMP	%	—	90	—
Softwood kraft	%	10	10	50
Hardwood kraft	%	—	—	50
Basis weight	g/m^2	88	85	86
Ash content	%	13.5	13.5	13.6
Density	kg/m^3	640	660	745
Tensile index, $\sqrt{\text{MD.CD}}$	Nm/g	37.6	35.0	31.6
Tear index, $\sqrt{\text{MD.CD}}$	mN.m^2/g	5.6	5.7	6.3
Brightness, ISO	%	82.5[1]	81	80
Opacity	%	91.5	90.9	90
Roughness, bendtsen	ml/min	260	200	137

1. Contains optical whitener.

For high-freeness absorbent pulp grades in particular, the market demands low resin content. Low resin content is also required in certain printing grades to avoid fiber "pick-out" problems due to poor fiber-to-fiber bonding caused by retained resins. For other grades, paper machine water systems can incorporate pitch control chemistry to alleviate problems. For such end-use applications, resin content of pulps is less critical. Resin removal may be performed both on chips by squeezing in screw feeder devices and in pulp by effectively washing pulps throughout the refining and bleaching processes. Displacement-type wash presses are now available for this purpose. Pitch should be removed by cleaning the interstage washwater. Further technology development is under way for this important subject.

Most CTMP processes use two or three stages of refining, depending on the application. The selection of refining systems normally involves low-intensity refiners (large refining surface area). Such refiners produce pulp with superior bonding and longer average fiber length than those with a smaller disc diameter.

Treatment of high-freeness pulp after the chip refiner is becoming more common. Such treatment may consist of washing, chemical treatment and washing, or interstage bleaching and washing. Interstage treatment and washing is effective for removing resins and pulping chemicals and can enhance the performance of the subsequent refining equipment. Reject or long-fiber sulfonation is another alternative.

The initial bleaching and pulp washing, in what can now be described as a brightening "sequence," may take place in the refiner plant. Modern CTMP bleach plants are built for high-consistency (25+%) or medium-consistency (10+%) operation or a combination of the two. Bleach liquor and washwater circulation schemes are usually countercurrent, adding fresh chemicals largely in the last stage and sewering from the first stages.

The current marketing success of aspen BCTMP has provided promise and considerable activity in expanding the supply of this grade. The differences in fiber morphology bring new challenges for process and equipment suppliers. Fine fiber aspen responds better to different chip chemical treatment, especially higher alkali application. The presence of alkali and much smaller fiber dimensions (vs softwoods) significantly affects refiner operation. A minor fraction of softwood fibers co-refined with aspen has yielded good pulp quality and marketing results. Interstage treatment is effective in removing the alkali early in the process.

In modern, flexible, high-yield market pulp mills designed on the two-line concept, one production line can produce a high-freeness product while the other produces a lower-freeness product. The refiner plant operation in such mills is dictated largely by the objective of producing the correct proportions of each fiber fraction (i.e., long fiber, middle, fines) to meet the needs of the mill without making a surplus of any one fraction. To assist in refiner plant operation, plate distance sensors and pulp quality monitors are becoming more common. Currently, these units are used mainly for process monitoring to aid in providing a basis for operating decisions. The screening plant now performs the function of a fiber fractionation plant, which sends long-fiber fractions to the high-freeness line and short-fiber fractions to the low-freeness line (i.e., with no surplus of fines). The process design must be adaptable to the different morphologies of varying wood species.

The flexibility of the BCTMP process allows production of grades of BCTMP with selected properties close to either mechanical or chemical pulps but always with other properties moving in the opposite direction (e.g., higher fines give better formation but lower tear; more chemical impregnation to improve strength leads to lower yield, etc.). Adequate online process control and operational stability in the refiner plant and fractionation system are essential since changes in the screen reject rates lead to rather rapid variations in pulp quality.

Pulp pressing equipment, fluffing devices, and drying technology have been improved to enable repulping without fiber bundles or "knits." This has solved such previous end-use problems as "fish eyes" in the paper. Squeezing and pressing the fine hardwood fibers can cause formation of fiber bundles, which are unacceptable for fine and printing grades of paper. Close attention to selection and operation of process pulp pressing equipment is required to avoid such problems.

Although initially a problem, repulpability has improved dramatically. Flash-dried bales of pulp, especially mechanical pulps, take longer to repulp than do sheeted pulps. This is a function of the time required to wet and slough off fiber from the sides of a whole bale vs easier water penetration into unbundled sheets. The poorer wetability of most CTMP, compared with chemical pulp, has also been a factor. However, the cost of repulping facilities for a user mill with a small capacity having the opportunity of using small amounts of BCTMP must be compared with the end-product production cost and technical advantages. Airborne dryers are now used by several companies to allow rolled dried pulp to be marketed. Note that all BCTMP to date is marketed in flash-dried or airborne-dried form (Table 1), with the exception of one company each in Brazil and Mexico (wet lapped) and another company in eastern Canada, which "can dries" the product on a converted sulfite pulp cylinder dryer.

The driving forces for technological improvements have come mainly through refiner and chemical suppliers and consultants rather than directly from the market and pulp and paper producers. Early pulp user experiences with BCTMP uncovered problems or opportunities that served as the basis for developments. Published experiences from BCTMP users have been limited, although suppliers and consultants have been generally effective in providing nonproprietary feedback.

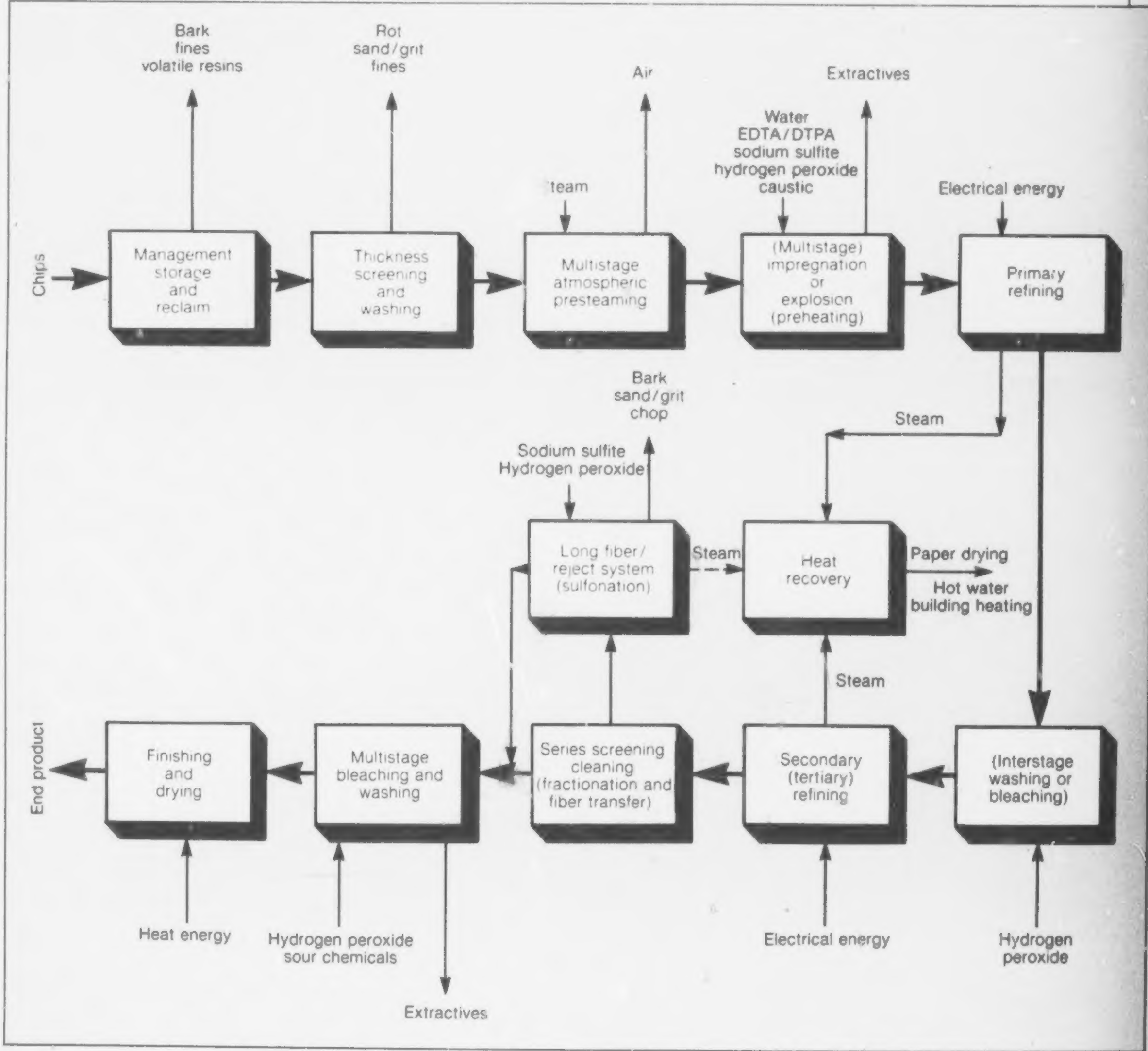
Just a few years ago, it was thought that only CMP (lower yield, higher strength) would be suitable for certain high-quality tissue grades. However, to date, almost the only end use for CMP has been for newsprint reinforcement. Current BCTMP has sufficed.

Table 16 outlines a summary of present technological advances and their results in quality improvement. Figure 5 outlines a typical basic process block flow diagram for market BCTMP.

Process effluent must be treated to comply with regional standards, which are moving quickly toward tighter restrictions on the volume and quality of effluent discharged. Treatment includes removal of suspended solids in a clarifier (primary treatment) followed by secondary treatment to remove soluble chemical compounds, such as resin acids, which consume oxygen and/or are toxic to water life when discharged.

Secondary treatment is most commonly performed in aerobic systems, in which microorganisms consume air or pure oxygen to eliminate oxidizable chemicals in the effluent. These systems include aerated stabilization basins, where treatment is for eight to ten days, or activat-

FIGURE 5: **Typical basic BCTMP flow diagram.**


Bark
fines
volatile resins
Rot
sand/grit
fines
Air
Extractives
Water
EDTA/DTPA
sodium sulfite
hydrogen peroxide
caustic
Steam
Electrical energy
Chips
Management storage and reclaim
Thickness screening and washing
Multistage atmospheric presteaming
(Multistage) impregnation or explosion (preheating)
Primary refining
Bark
sand/grit
chop
Sodium sulfite
Hydrogen peroxide
Steam
Long fiber/reject system (sulfonation)
Steam
Heat recovery
Paper drying
Hot water
building heating
Steam
End product
Finishing and drying
Multistage bleaching and washing
Series screening cleaning (fractionation and fiber transfer)
Secondary (tertiary) refining
(Interstage washing or bleaching)
Heat energy
Hydrogen peroxide
sour chemicals
Extractives
Electrical energy
Hydrogen
peroxide

ed sludge systems, which require one to two days' treatment with higher rates of oxidation. There is a trend toward use of activated sludge systems, as these permit lower solids discharge than aerated stabilization basins. Secondary treatment can also be performed in anaerobic systems, in which treatment takes place in an oxygen-deficient atmosphere and methane gas is produced for burning. Anaerobic systems normally are followed by two days of aerobic treatment to ensure toxicity removal. More precise operational control is required with anaerobic systems.

Biological treatment is the most cost-effective means of destroying oxygen-consuming waste when the concentration of this waste is less than 2,500 to 3,000 ppm of BOD_5 (biological oxygen demand), as is the case with BCTMP. Recent designs have moved toward segregating low-volume concentrated highly toxic streams (such as plug screw feeder pressates) from the plant, with a view to disposing of these by other forms of oxidation, such as wet oxidation or burning in an incinerator. Development in this area is ongoing but not yet commercially adopted. Figure 6 shows a typical BCTMP effluent treatment facility flow diagram.

In addition to advancements in market BCTMP mill technology, significant gains have been made in end-use manufacturing technology. Chemistry is a key point with regard to end uses. Alkaline papermaking has grown substantially during the past several years. It is estimated that alkaline-produced wood-free paper will approach 9 million tons in North America by 1990, representing more than 50% of total capacity. This has been driven largely by developments in onsite precipitated calcium carbonate production, which provides attractive economic and quality benefits to papermakers.

Use of alkaline paper presents a number of advantages, the key one being longevity. Alkaline-produced wood-free paper can exist with little change for more than 100 years. However, acid-sized paper will typically show degradation after 50 years.

In alkaline papermaking, calcium carbonate is used as a filler. In many cases, this is a lower-cost alternative and offers a higher brightness (close to 90%). Carbonate is particularly useful in BCTMP-containing paper. The high pigment brightness compensates for the relatively lower BCTMP brightness. The BCTMP fiber structure allows for higher carbonate loadings while maintaining bulk. This further reduces costs and also helps to minimize brightness reversion (long-term aging) to increase strength and improve runability.

ECONOMICS. Use of high levels of BCTMP in printing paper requires some changes in the papermaking process to optimize the benefits of properties and economics. Developments in high-performance, dual-component, wet-end chemical systems have made it possible to overcome the problems of slow drainage and the lower strength of BCTMP compared with chemical pulps. These same chemical systems also provide high retention, allowing increased filler loadings of 30% and higher. Without such changes in the wet-end chemicals, it becomes difficult to fully utilize the benefits of BCTMP.

Mere substitution of BCTMP for chemical pulp fibers does not, in some cases, provide sufficient incentive for the development of new grades. The real incentive comes when the bulk benefit of BCTMP is utilized to load the paper with a higher level of filler. This way the furnish costs are reduced, and printability and surface characteristics are improved.

The current economy of scale for a two-line market pulp mill is a nominal 650 to 700 air-dry tpd (or 200,000 to 240,000 tpy), depending on wood species and end product. This allows the installation to fractionate for various end products, as discussed.

The approximate capital cost in North America for a two-refiner line, 200,000-tpy greenfield mill (flash dried), is between $180 and $220 million, depending on

TABLE 16: **BCTMP technology improvements.**

Item	Result
Chip management and washing	Lower fines/bark/rot Correct size, including thickness Better deresination Lower dirt
Multi-stage presteaming impregnation	Lower extractives Lower chemical consumption Lower reversion Lower fines Higher strength Higher brightness Higher quality, uniformity
Refining	Higher quality Lower power consumption Better control/uniformity Improved plate life Increased steam recovery Higher capacity
Interstage washing or bleaching	Lower extractives Lower chemical consumption
Screening/cleaning	Proper fractionation Higher quality
Long fiber/rejects	Increased strength Lower linting Proper fiber fraction Higher quality
Dual lines (fractionating)	Better high and low CSF grades Higher qualities
Bleaching/washing	Higher brightness Lower chemical consumption Lower reversion Reduced operating cost Lower extractives
Finishing/drying	Better repulpability Lower reversion No "fish eyes"

location and wood species. This includes a woodroom, interest during construction, and working capital but not land costs. One of the highest cost components currently is environmental treatment facilities. Capital should not be reduced if this will sacrifice quality or flexibility.

Operating costs are, of course, dependent on end product, wood species, mill location, labor, transport, and financing return. However, more than 70% of operating expenses are attributed to wood, power, and chemical costs.

Table 17 provides an operating cost component comparison for various BCTMP-producing nations. In addition to those shown, these costs vary internally for these countries.

Table 18 shows a typical comparison of a greenfield market aspen fully bleached kraft mill and a market aspen BCTMP mill. It is unlikely, however, that a kraft mill of this relatively small size would be built now.

The driving force for the construction of new market BCTMP mills has been the comparatively high capital and operating costs of new chemical pulp mills.

By early 1989, the following phenomena had arrived at the same time:

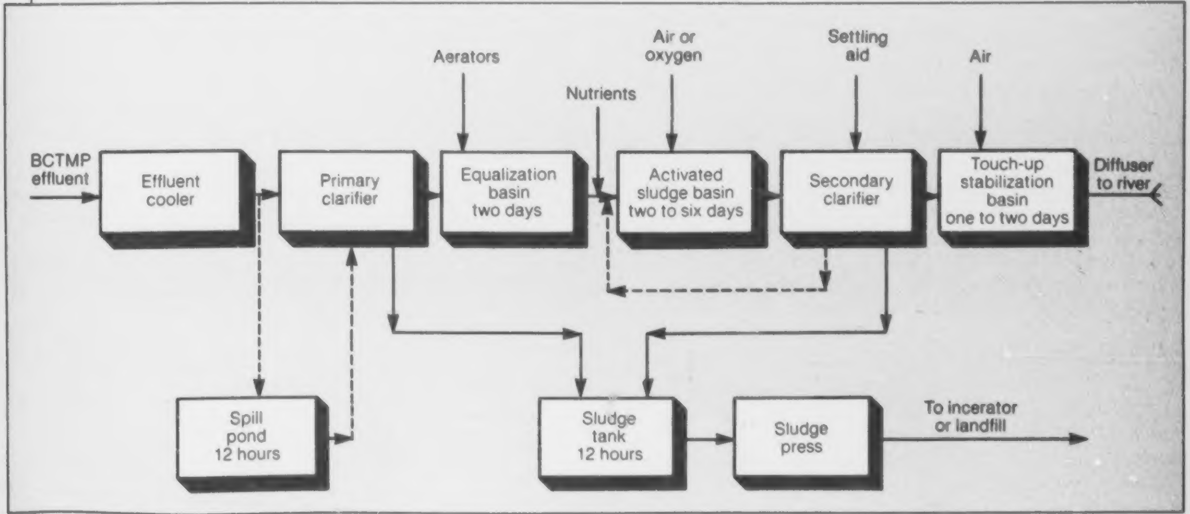
- Advanced technology for BCTMP
- Advent of the utilization of other worldwide wood species, such as aspen, eucalyptus, and various pines
- Growth in world awareness of and interest in BCTMP over the past five years
- Availability of consistent, high-quality BCTMP in quantity

TABLE 17: **Manufacturing cost comparison of BCTMP components by region.**

Component	**Sweden**	**Norway**	**Finland**	**Canada** **West (interior)**	**Prairies (base)**	**Quebec**	**Maritimes**	**U.S. (South)**	**South America**	**Australia New Zealand**
Main BCTMP species										
Softwood	Spruce	Spruce	Spruce	Spruce	Spruce	Spruce	Spruce	Southern pine	Various pines	Radiata pine
Hardwood	Aspen	Aspen	Aspen	Aspen	Aspen	Aspen	Aspen	(N/A)	Eucalyptus	Eucalyptus
Raw material										
Softwood	High	High	Highest	Low	Low	High	High	Low	Lowest	High
Hardwood	High	High	Highest	Low	Low	Low	High	N/A	Lowest	High
Electrical energy	High	Lowest	Highest	High	Low	Low	High	High	High	High
Chemicals (pulping)	Low	Low	Lowest	Low	High	Low	High	Low	Highest	High
Labor	High	High	High	Highest	High	Low	High	Low	Lowest	High

1. Costs are variable internally.
2. Electrical costs exclude any incentives.
3. Early 1989 currency rate comparison.
Source: NLK-Celpap.

FIGURE 6: **Typical effluent treatment flow diagram.**


Aerators
Air or oxygen
Settling aid
Air
Nutrients
BCTMP effluent
Effluent cooler
Primary clarifier
Equalization basin two days
Activated sludge basin two to six days
Secondary clarifier
Touch-up stabilization basin one to two days
Diffuser to river
Spill pond 12 hours
Sludge tank 12 hours
Sludge press
To incerator or landfill

- Acceptance of hardwood chemical pulp as a desirable furnish
- A tight market chemical pulp supply
- High-cost market chemical pulps.

Pricing for various market pulps is shown in Figure 7.

SUMMARY AND OUTLOOK. Sales techniques relating to market BCTMP require technical input from both the specifiers and the paper or pulp producers. A shortage currently exists of dedicated, technical expertise in both the manufacture and sale of BCTMP.

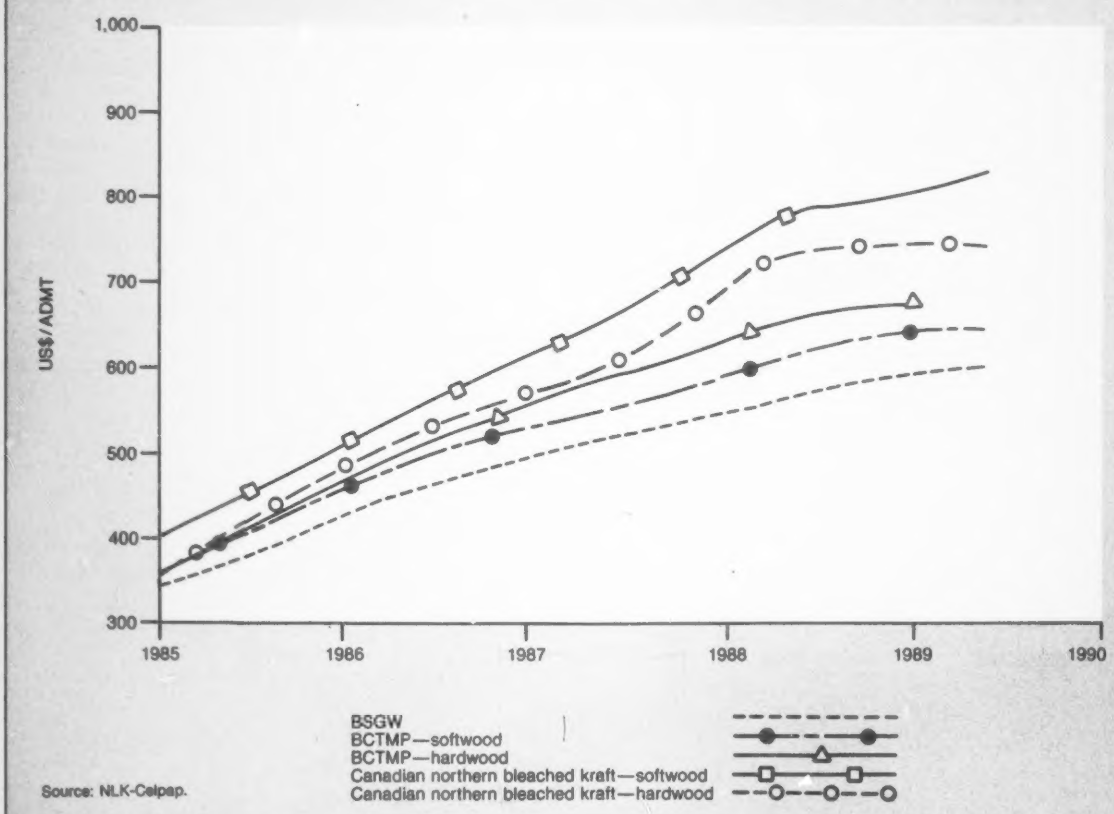
As hardwood kraft evolved from a filler to a premium pulp in the past, so time and technology will surely see market BCTMP evolve in a similar way. During the past ten years, the major gains in pulp quality and uniformity have arisen from improvements in process equipment design and arrangement. The next few years belong to chemistry. A deepening understanding of high-yield

TABLE 18: **Comparison of market hardwood kraft and BCTMP for typical western Canadian greenfield mill (750 air-dry tpd).**

Item	Unit	Aspen — 400 CSF FBK	 BCTMP
Yield	%	50	90
Personnel	Number	300	100
Energy (total)	kWh/a.d. ton	750	3,000
Water	m^3/t	50-60	20-25
Effluent — BOD	kg/t	20-30	60-80
Emission — air	—	Smell	Odorless
Strength properties	—	Base	Lower
Brightness, ISO	%	92	86
Opacity	—	Base	Better
Reversion	—	Base	Higher
Operating cost	US$/a.d. ton	360	300
Capital cost	US$ million	550-600	200-220
Sales price[1]	US$/a.d. ton	720	685

[1] First-quarter 1989.

FIGURE 7: **Paper-grade market pulp pricing.**



Source: NLK-Celpap.

pulping and bleaching chemistry, effluent treatment chemistry, and chemistry of conversion processes for high-yield-pulp-containing products (e.g., alkaline papermaking) will help to solidify the acceptance of BCTMP in high-quality products.

Other technological trends are foreseeable in the near future:

- Lower chemical consumption resulting from improved washing and mixing
- Lower energy consumption due to higher freenesses and better plate design for a given quality
- Improved quality and fiber classification due to advanced fractionation techniques
- Pulp drying utilizing all steam from refining system
- Evaporation and incineration technology
- Lower-cost environmental treatment facilities
- Online chip bulk density and moisture measurement capabilities
- Online pulp quality monitoring.

But major problems remain to be resolved:

- Color stability
- Whiteness/shade
- 90% brightness for only a few end products.

It is estimated that only about 10% of paper produced receives sufficient exposure to ultraviolet light for reversion to be a practical problem. The term "reversion" needs to be quantified, and proper measurement methods need to be determined.

Several terms will or should be eliminated from high-yield pulping terminology:

- Rejects (when included with long fiber)
- Freeness (when used as a specification for the purchase of BCTMP instead of quality)
- TMP (CTMP equipment gives higher pulp quality even when operated in the TMP mode).

Society will demand environmentally favorable paper. Nonrecyclable products, such as diapers, are an ideal end use. BCTMP will be used in increasing amounts with chemical fibers as a substitution offering certain technical and cost advantages and with waste to enhance its properties. Remember that brightness or "permanence" is not critical for all grades. Long life is not critical for all products.

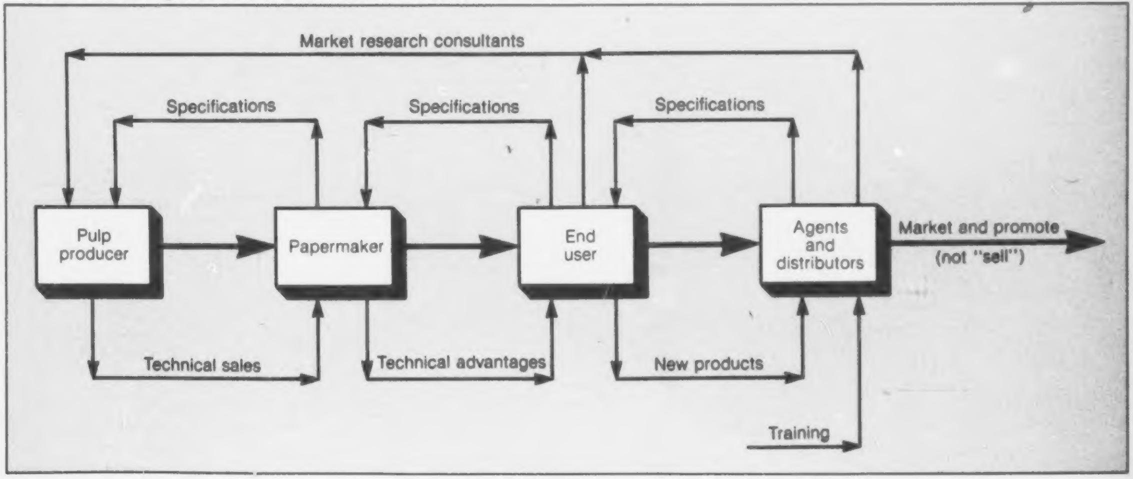
Whether to purchase or to integrate is a perplexing problem. With the present high price of kraft, BCTMP will move into more end products. Many nonintegrated mills that purchase chemical pulp are looking at backward integration. What will the driving forces be: cost only or cost, quality, and new products? The technical advantages of BCTMP will not become evident worldwide until the new-technology pulps have entered the marketplace (especially the printing and writing sector) and feedback is received. Many current and planned market BCTMP mills will forward integrate in the near future.

The reluctance by certain companies, agencies, and individuals toward the further utilization of BCTMP should at least be replaced with end-product trials using current-generation pulp. The lesser-quality pulps of past years marketed prior to their optimization have long since improved.

Wood-free rules will have to be redefined to allow not only the use of these new pulps but also the creation of new printing and writing paper grades. Lignin content is the only true comparison between groundwood and BCTMP.

BCTMP needs to be marketed and promoted as a tailor-made product. Even though any pulp is truly a commodity, BCTMP should not be sold as such. True knowledge or understanding of this pulp is still lacking. An approach is outlined in Figure 8. ■

FIGURE 8: **Marketing the increased utilization of BCTMP.**



ISSUE FOCUS: **COATING**

INORGANIC MINERAL, CHEMICAL MARKET EXPECTED TO REMAIN STRONG IN 1989

Increased paper demand fuels consumption; precipitated calcium carbonate satellite plants affecting formulations; pricing to soften

By STEVE VAN KOUTEREN

In recent years, extender and filler minerals have played an increasingly important role in the North American paper industry. The main reasons are related to the 200% increase in pulp prices since 1986, the need for improved printing surfaces, and the robust demand for printing and writing paper. As a direct result of these events, consumption of extender and filler minerals in paper in 1988 reached a record high of 5.6 million tons valued at more than $1 billion.

Kaolin, which accounts for more than 75% of the total mineral demand (on a tonnage basis) in printing and writing paper, is the dominant mineral used by the paper industry (Figure 1). Second to kaolin is calcium carbonate, followed by titanium dioxide (TiO_2). Other extender and filler minerals used in paper are alumina hydrate, diatomite, precipitated silica and silicates, and silica gel.

Extender and filler material use in printing and writing paper represents more than 90% of total volume on a tonnage basis. The balance is used in coated paperboard and cigarette paper. Within the printing and writing paper segment, coated paper uses approximately 60% of extender and filler minerals, with uncoated paper accounting for the balance (Figure 2).

Strong extender and filler material demand during the past three years has tightened supply, firmed prices, and strongly increased suppliers' profits. As a consequence, nearly every major supplier has invested in new capacity; thus, extender and filler mineral supply should ease in the next few years.

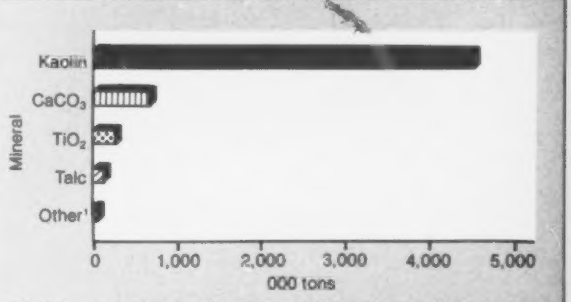
NEW KAOLIN CAPACITY. Double-digit coated paper demand growth in 1988, particularly in lightweight coated (LWC) and premium coated paper, contributed to increased kaolin demand last year. Kline & Co. estimates that demand for calcined, delaminated, and premium coating kaolin grades increased more than 5% in 1988, while air-floated and hydrous filler grades increased 3%.

Three years of strong demand for calcined, delaminated, and premium coating grades decreased availability, firmed prices, and motivated suppliers to expand capacity. Recent kaolin capacity increases by Engelhard, ECC America, Georgia Kaolin, J.M. Huber, and Thiele Kaolin amount to more than 700,000 tons of new capacity. This should ease market tightness and return some of the competitive pressure to prices seen in the mid-1980s.

CALCIUM CARBONATE FAST TRACK. The record-high pulp prices and growing market acceptance of alkaline paper have increased calcium carbonate demand by more than 15% during the past year. This increase is largely a result of growth in alkaline printing and writing paper capacity (excluding newsprint) to nearly 30% of total capacity in North America.

The proliferation of Pfizer's precipitated calcium carbonate (PCC) satellite plants has made PCC the dominant carbonate filler at the expense of ultrafine ground calcium carbonate (UFGCC). Satellite plants provide pa-

FIGURE 1: **North American extender and filler mineral consumption in paper, 1988.**



1. Includes alumina hydrate, diatomite, precipitated silica and silicates, and silica gel.

Source: Kline & Co., "Extender and Filler Minerals North America—1988."

Mr. Van Kouteren is a consultant with Kline & Co., Fairfield, N.J.

per mills with transportation cost savings and customized filler specifications as well as a guaranteed supply source.

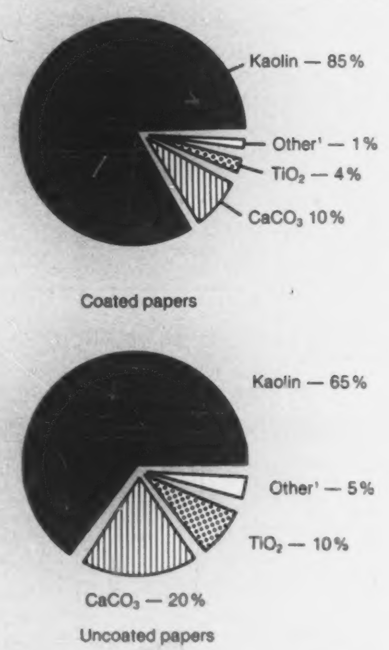
Although PCC is the dominant carbonate filler, UFGCC still dominates the carbonate coating market. Recently, however, PCC also has begun to encroach on this segment. Advances in PCC particle shape and distribution have enabled it to partially displace UFGCC in coated paper.

On the supply side, PCC capacity continues to grow. Currently, ten PCC satellite plants are operating, and at least five more new PCC plants will begin production this year. Kline & Co. expects that by the end of 1989, total PCC satellite capacity will be more than 600,000 tpy (Figure 3). At year-end, Pfizer will have at least 11 operating plants. Steel Brothers, Champion, Olin, and Finch Pruyn each operate one satellite plant.

Despite recent acquisitions in the UFGCC industry, excess capacity exists. During the past year, Omya (Pluess-Staufer) acquired Steep Rock/Ontario Carbonates, and Georgia Marble was put up for sale. Omya recently shut down the Ontario Carbonates UF operation and probably will expand its Vermont facility.

Contrary to recently announced UFGCC price increases, discounts are still occurring in the paper market. Price discounts reflect the current oversupply situation of the UFGCC business. PCC prices are reported to be [illegible]

FIGURE 2: **North American extender and filler mineral consumption in paper, 1963-93.**



1. Includes alumina hydrate, diatomite, precipitated silica and silicates, and silica gel.

Source: Kline & Co., "Extender and Filler Minerals North America—1988."

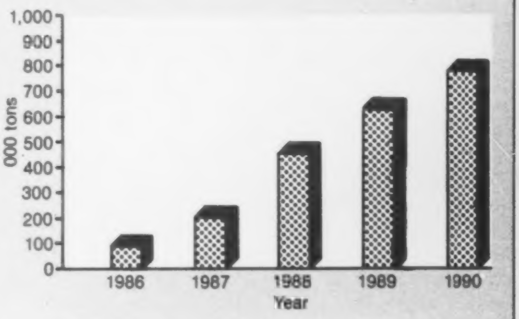
TiO_2 PRICES ON THE RISE. The TiO_2 market remains tight, and prices will continue to increase. Despite efforts to extend TiO_2, the push for whiter and more opaque LWC and uncoated printing and writing paper kept demand for this mineral at a steady 4% growth rate during 1988. Calcined kaolin, precipitated silicates, and PCC have had the biggest impact on TiO_2. Some companies report more than 50% of their previous TiO_2 requirements being satisfied with extenders in some uncoated business paper. However, TiO_2's opacity is far superior than other minerals, and, where opacity is crucial, less than 15% of TiO_2 is displaced.

Recent debottlenecking efforts at U.S. TiO_2 facilities have provided about 60,000 tpy of additional capacity but supply is still tight. Supply should begin to ease in 1990 when Du Pont, Kemira, and SCM bring online a total of about 180,000 tpy of new domestic capacity.

Demand is expected to outpace capacity expansions; therefore, price increases are expected to continue until the early 1990s. Another price increase, to approximately \$1/lb effective Apr. 1, was announced in at the end of March.

OUTLOOK. Overall, Kline & Co. expects extender and filler demand growth in paper to continue, but at a slower pace for the next five years due to slower growth in the U.S. economy. During the same period, much of the planned TiO_2 and kaolin capacity will come online. Slower growth, combined with increased supply, will likely result in a softening of extender and filler mineral

FIGURE 3: **Estimated North American satellite PCC capacity, 1986-90.**



Source: Kline & Co., "Extender and Filler Minerals North America—1988."

prices.

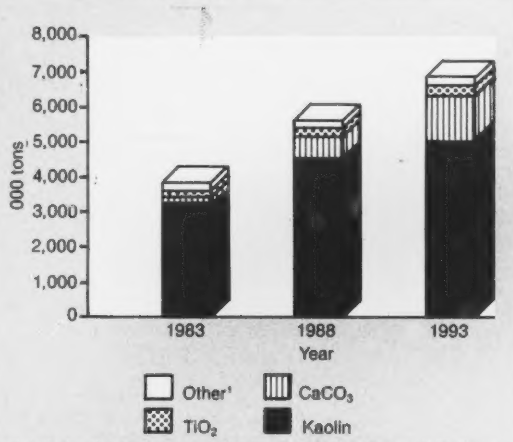
Kaolin demand will slow due to substitution of calcium carbonate for kaolin in the paper filler market and softening TiO_2 prices (Figure 4). Recent capacity expansions, along with slower demand growth, will also cause kaolin prices to soften in 1990. Prices may soften even more if kaolin deposits currently being developed in Canada are successful in producing a quality paper grade.

In contrast to the kaolin market, calcium carbonate will maintain double-digit growth as the percentage of alkaline paper capacity continues to grow. By 1992, more than 45% of all printing and writing paper, excluding newsprint, will be produced in an alkaline environment. As a result of the strong growth, future price increases or fewer discounts can be expected for most grades of calcium carbonate.

TiO_2 demand will grow at only about 2% to 3% during the next few years. Slower growth, along with worldwide increases in capacity, will result in a slight oversupply, causing prices to soften.

In summary, paper companies can expect to see an increase in extender and filler mineral availability during the next five years. Price discounts for kaolin and possibly for TiO_2 should follow the increase in supply. ■

FIGURE 4: **North American extender and filler mineral use in printing and writing paper by type, 1988.**



1. Includes alumina hydrate, diatomite, precipitated silica and silicates, silica gel, and talc.

Source: Kline & Co., "Extender and Filler Minerals North America—1988."

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U.S. LINER MARKET SHOULD REMAIN IN BALANCE WITH NO SERIOUS OVERSUPPLY

But higher capacity growth plus moderate recession may cause operating rates to dip in 1990, Unbleached Kraft Conference told

By WILL MIES, Executive News Editor

The outlook for the U.S. linerboard industry is relatively positive through late 1989, Thomas P. Clephane, managing director, Morgan Stanley & Co., told nearly 400 industry executives and customers attending *Pulp & Paper*'s Third International Unbleached Kraft Conference in Atlanta, Ga., last November. No oversupply situation should develop, even with a moderate recession in 1990, he said.

Box shipments are expected to rise 2.5% in 1989 and then flatten in 1990, with no growth in the U.S. economy. He projected U.S. linerboard exports will rise about 4% to 5% in 1989 and 1990, after declining slightly last year due to a sharp drop-off in shipments to China.

As a result, total U.S. linerboard production is expected to rise about 2.5% in 1989 and 0.6% in 1990. Adjusted mill operating rates would drop to 96.6% in 1989 and then decline to 93.7% in 1990 in a moderate recession (Table 1).

"An environment in which the operating rate reaches 93% to 94% is usually considered a seller's market, as producers generally have the power to raise prices faster than their costs escalate," Clephane noted. Some price erosion could occur in 1990, but "the absence of major capacity additions and a firm tone in the export market should prevent a price break of the dimensions the industry experienced in 1982 and 1985."

One source of concern is new U.S. linerboard capacity growth, which Clephane estimates will rise about 4%/year from 1986-89. This new capacity is mainly coming from machine rebuilds (particularly the addition of new press sections) and conversion of kraft paper machines to linerboard production. Only two new U.S. linerboard machines have been announced for the 1988-91 period (although a new clay-coated boxboard machine will initially produce some unbleached linerboard).

There has been a similar absence of new semichemical medium machines announced for the U.S., noted Peter Bogan, vice president-sales, Mead Corp. Nevertheless, capacity growth will continue at historical levels through upgrades of existing facilities. Semichemical medium capacity will grow about 2.8%/year between 1988-91, while recycled medium will increase 4.5%/year.

KRAFT PAPER REVIVAL? Plastic packaging continues to make inroads into the retail bag and sack market, but growing environmental pressure may have some effect on slowing the trend, James Doughan, senior vice president, Stone Container Corp., indicated. Last year, a bill was passed in Suffolk County, N.Y., effectively banning plastic retail T-shirt sacks, and similar legislation has been introduced in other states.

Kraft grocery sack shipments have declined from about 1.6 million tons in 1980 to under 1.2 million tons in 1987. As a result, total unbleached kraft paper shipments have declined from 3.8 million tons in 1980 to about 3.04 million tons in 1988. On the supply side, capacity has suffered a similar decline. "Since 1984, 860,000 tons of unbleached kraft paper have been converted to the manufacture of other products or shut down," Doughan noted. "So, despite a significant drop-off in demand, operating rates have remained high."

What happens in the kraft paper market could have a significant impact on linerboard capacity growth, Doughan noted. In 1987, swing machines made 877,000 tons, or about 29% of all kraft paper manufactured, and 2.1 million tons, or about 12% of all linerboard produced.

"We hesitate to build new nonreplacement liner machines as long as the threat of decreasing kraft paper shipments hangs over our heads," Doughan said. "On the other hand, the environmental attack on plastic packaging could lead to a revitalization of the kraft paper market."

NEW HIGH-STRENGTH GRADES. The containerboard industry has begun to introduce "high-strength" grades to combat escalating box prices and improve quality and consistency of performance, said Robert Kramer, vice president, Nekoosa Packaging Inc.

Although a variety of confusing claims are being made, high-strength grades should provide substantially more compression strength per pound of fiber than conventional containerboard. The standard Nekoosa Packaging has established for high-compression containerboard is an average performance level of 2 lb of ring crush/lb of basis weight. In other words, a high-compression 42-lb linerboard has to demonstrate at least 84 lb of ring crush on average.

"Today there is still considerable variation in ring crush performance within the industry," Kramer noted. He presented a graph indicating that average industry ring crush for 42-lb linerboard has been improving during the past several years but still ranged anywhere between about 60 and 95 lb in 1987. "Our industry is increasingly recognizing the importance of ring crush as it relates to finished box compression and is taking steps to improve it." But considerable variation still exists, and this affects the compression strength of the finished box, Kramer said.

IMPROVING GRAPHIC QUALITY. Manufacturers of consumer goods are increasingly interested in using packaging design and graphics as a means of influencing the purchasing decisions at the retail level, noted Frederick V. Ernst, president of Chesapeake Corp.'s West Point, Va., operations.

As a result, interest is growing in white linerboard grades, which offer various trade-offs in print quality, box performance, and cost. About 1.06 million tons of mottled white linerboard and 130,000 tons of uncoated bleached linerboard were consumed in the U.S. in 1987. In addition, an estimated 40,000 tons of coated bleached and unbleached linerboard are being used for preprinting. Another alternative is litho laminating, which offers the highest print quality but is the most expensive alternative (Table 2).

Altogether, the U.S. market for white grades is about 1.25 million tons, which means that about 15% of the boxes made in this country have some form of white on their exterior facing, Ernst estimated. "Within the white linerboard market, there is clearly going to be some reshuffling as high-quality grades are used increasingly in preprinted and direct-printed boxes."

On its new No. 3 machine, Chesapeake is producing an upgraded mottled white board and is developing a white-top grade. These new grades should offer competitive advantages over the existing white linerboard grades, Ernst indicated.

ADVANTAGES OF MULTI-PLY FORMING. How Willamette Inc. decided to completely shift over its linerboard production to multi-ply forming and the resulting improvements in sheet quality were described by Steven R. Rogel, executive vice president. The company has rebuilt two machines at its Albany, Ore., mill to make multi-ply linerboard. And last year, it rebuilt the machine at its Campti, La., mill to make a three-ply board.

"The box user is demanding higher and assured levels of quality, greatly reduced variability, and quicker delivery of small quantities," according to James Stevenson, president of SAS International said. "The importance of uniformity of moisture, porosity, color, printing surface, and receptivity to adhesives continues to grow." His remarks summed up a panel discussion on changing roll stock quality, which included William McGrattan, manager-technical services, Domtar Packaging; Richard Van Horne, president, Corrugated Supplies Corp. (Chicago); Steve S. Applegate, purchasing manager, Procter & Gamble Co.; and Joao Martins, president, Unor (a Portuguese box converter).

EUROPEAN LINER GETTING WHITER. Corrugated case consumption in Western Europe has shown 4% to 5% annual growth the last several years, according to Alain Soulas, president, Cellulose du Pin. But the average since 1980 has been about 3.1%, and this will probably be close to the trend in the future.

Helping corrugated box demand has been the increasing importance of supermarkets and hypermarkets in retail distribution. As a result, packaging has an in-

TABLE 1: **U.S. linerboard industry supply and demand forecast, 1988-90 (000 short tons).**

	1988	1989e	1990e
Production	17,996	18,500	18,700
% change	1.8	2.8	1.1
Exports	2,282	2,400	2,500
% change	−0.6	5.2	4.2
Production for U.S.	15,716	16,100	16,200
% change	2.1	2.5	0.6
Inventory change	−8	0	100
U.S. consumption	15,722	16,100	16,100
% change	3.9	2.4	0.0
Box shipments			
% change	3.2	2.5	0.0
Real GNP			
% change	3.8	3.0	0.5
FRB[1] production index			
% change	5.7	3.7	−0.5
Capacity (API)[2]	18,613	19,084	19,796
% change	3.7	2.5	3.7
Operating rate[1]	96.7	96.9	94.5
Adjusted capacity[3]	—	19,159	19,951
% change	—	2.9	4.1
Operating rate[3]	—	96.6	93.7

1. Federal Reserve Board.
2. Based on American Paper Institute's December 1988 survey.
3. Swing capacity shift from kraft paper to linerboard increased effective linerboard capacity by about 15,000 tons in 1988 and by an estimated 75,000 tons in 1989 and 80,000 tons in 1990.

Source: Morgan Stanley Research estimates (updated slightly from original presentation).

TABLE 2: **Estimated U.S. white linerboard market.**

	Tons (000)	Annual growth
Mottled white	1,060[1]	7.7%
Uncoated bleached	130[1]	4.4%
Coated (total)	40e	—
Litho laminate	—	—
	1,250	

1. American Paper Institute 1987.

creased role in promoting products. Food products, which account for about half of corrugated use, have been showing particularly strong growth.

Growth in European containerboard consumption has been somewhat slower, increasing at a 2.2%/year rate since 1980 to about 11.4 million tons in 1987. However, unbleached kraft linerboard shipments to Europe have been growing only at about a 0.5%/year rate, including an expected 3% rise in 1988. The slower growth for kraft liner reflects the increased market share being captured by wastepaper-based liner.

Soulas said he expected wastepaper-based liner to continue to increase market share in Europe in coming years but at a slower rate since the fast-growing food packaging market uses more kraft liner. Unbleached kraft liner shipments to Europe will probably grow at about a 1%/year rate in the future, he said. Meanwhile, European unbleached linerboard capacity over the next several years will be rising at about a 3.5%/year rate.

The market share for white liner grades in Western Europe increased from 11% in 1981 to 16% in 1987, according to Mattias Wigardt, marketing manager and director at ASSI Kraftliner. White-top liner showed the strongest growth, increasing from 3% to 9% of the total kraft liner market. Mottled remained steady at just below 6%, while fully bleached lost almost half of its market share (Figure 1).

Total consumption of white kraft liner grades in Europe is currently close to 600,000 metric tons, while another 250,000 tons of white testliner is also consumed, Wigardt estimated. The reason for the strong growth in white-top liner again has been the growing distribution of consumer goods and produce through large, self-service retail outlets, where the visual appeal of packaging is important.

The growing demand for white-top linerboard is also related to the spread of preprint technology, Wigart noted. At least 25 four- to six-color printing presses are now installed in Europe, and demand for decorative cases may increase by 10%/year in the most advanced European markets, according to one estimate. Traditional methods for postprinting boxes have been improving and showing 5% to 6%/year growth.

BETTER MARKET BALANCE IN JAPAN. Japan is the second-largest linerboard market after the U.S. but is also known as one of the most complicated and demanding in the world, according to Michael McCann, vice president, DaiEi Papers USA Corp. "This is due to a combination of higher consumer packaging requirements and a generally weak supply/demand ratio for a number of years causing intense competition."

Not much pure kraft linerboard is consumed in Japan, and the two most common grades are K' and K", which contain varying percentages of wastepaper, while C-liner is based mainly on wastepaper.

The Japanese containerboard industry has suffered from serious overcapacity, although actual operating rates are difficult to estimate because many machines produce a variety of grades (e.g., core board, chipboard, etc.). Under guidelines from the Ministry of International Trade & Industry (MITI), capacity has been reduced by 8% since 1980, while demand has increased 5% to 6%/year. "With no new capacity planned, it is estimated supply and demand will be balanced within the next two years," McCann said.

CHINA MODERNIZATION DRIVE. Since 1980, People's Rep. China's economy has seen rapid growth under its "reform and open door" policy. Exports have enjoyed strong growth, and this has led to increased demand for improved packaging, which meets international standards, said Chen Haiqing, deputy general manager, Import Dept., ChinaPack Inc.

In 1987, People's Rep. China's production of paper and board totaled 11.4 million metric tons, of which 6.6 million tons were paper and 4.8 million tons were paperboard (including 770,000 tons of kraft linerboard).

Due to its large population, growing exports and limited forest resources, People's Rep. China has to import substantial quantities of pulp, paper, and paperboard. In 1987, People's Rep. China imported 1.26 million tons of paper and board (including 490,000 tons of kraft linerboard and 180,000 tons of corrugating medium).

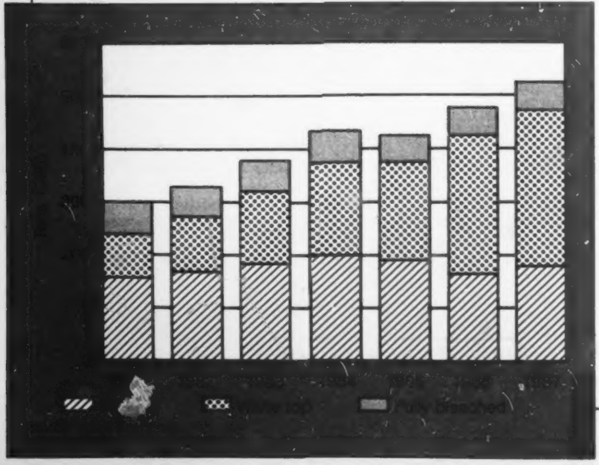
Under its modernization program, People's Rep. China has been making substantial progress in upgrading its domestic containerboard industry, Haiqing said. Rapid

TABLE 3: **Growth of testliner capacity in three Asian countries, 1980-90 (000 metric tons).**

	1980	[illegible]	[illegible]
Taiwan	720	1,200	1,950
Korea	250	1,040	1,030
[illegible]	95	340	400

Source: Pacific Forest Resources Inc.

FIGURE 1: **Consumption of white kraft liner grades in Western Europe.**



progress has also occurred in box production. About 250 plants, with about 80 corrugated lines, specialize in production of boxes for export packaging.

TESTLINER BULGE IN PACIFIC RIM. Despite the dramatic growth in U.S. exports to the region, it is not safe to assume that kraft linerboard is growing in popularity in the Far East, according to William A. Gleason, president of Pacific Forest Resources Inc. In fact, U.S. kraft linerboard share of the market in seven Asian countries (Hong Kong, Indonesia, Rep. Korea, Malaysia, the Philippines, Singapore, and Taiwan) has declined from 20% in 1980 to 16% last year, he estimated.

"The fact is that imported kraft linerboard plays a very limited role in domestic packaging within the region," Gleason noted.

Imports of kraft linerboard into the region will not grow significantly in the foreseeable future, even though duties and taxes in some countries have been reduced. This is because a phenomenal growth in testliner capacity is under way in such countries as Taiwan, Rep. Korea, and Indonesia. These three countries will be capable of producing 40%, or 700,000, more tons of testliner in 1988 than in 1987 and 65%, or 1.54 million, more tons in 1990 than in 1988 (Table 3).

WHO HAS THE LOWEST COSTS? U.S. linerboard mills currently enjoy a significant cost advantage over competitors in Scandinavia, thanks to the 1986-88 decline in the value of the U.S. dollar, but could face future competition from Pacific Rim countries with low wood costs, according to Fred D. Iannazzi, president of Andover International Associates. He estimated that the delivered cost in northern Europe for a southern U.S. linerboard mill was about $310/metric ton, compared with $360/ton for a mill in Sweden. However, he estimated the delivered cost for a mill in Brazil or Chile at around $220/metric ton. "Significant competition in kraft linerboard from nontraditional sources is not imminent but likely during the mid-1990s," he said.

WHY NO GREENFIELD MILLS. The economic design capacity for a state-of-the-art linerboard mill today is about 1,870 tpd—a figure largely determined by the size of new chemical recovery boilers, noted Nickey Rudd, vice president, BE&K Engineering. But few companies today have such "mega-projects" under study because of site location, financing, and marketing problems related to introducing such a large amount of capacity.

Rather, the industry is achieving substantial incremental capacity growth through modernization and expansion of existing mills. Such rebuild projects may add as much as 700 tpd and are usually designed to improve sheet quality and reduce manufacturing costs.

Major components of such projects may include new headboxes (some with multi-ply design), top-wire forming units, and a major press rebuild (either a 2,000-pli large-diameter roll press or a 6,000-pli shoe press). Fiber supply may be increased either by adding recycled fiber processing capability or by optimizing an existing kraft pulp mill. The cost of such rebuilds typically ranges from $45 to $60 million, resulting in average cost/daily ton of incremental capacity of $150,000 to $200,000.

"With currently identified projects, more than one-fourth of the existing linerboard machines will be equipped with modern forming sections and high-intensity press sections by the end of 1989," Rudd predicted. He added that up to half of the existing machines may have undergone such rebuilds by the end of 1990. Another alternative source of future industry capacity will come from the construction of smaller "mini-mills" based on recycled fiber near major metropolitan areas. Capital cost per daily ton for a recycled mill is about $150,000 to 250,000, compared with $300,000 to 400,000 for a greenfield kraft linerboard mill, according to Richard A. Reese, OPTEC technical manager at Rust International (see article on p. 153).

Financing alternatives for new projects and acquisitions in today's capital markets were described by Robert R. Morse, vice president, Salomon Brothers Inc. Due to depressed equity prices, paper companies have been going to public markets for debt financing in recent years.

Another alternative to public markets is private placements, which allow more customized financing. One example is project finance, which allows a project sponsor to borrow on a nonrecourse basis if project economics can support the leverage. Such financing is now being used for improving existing facilities (Stone Savannah River Pulp & Paper).

COATED KRAFT EXPANSION BOOM. U.S. capacity for natural kraft board (NKB) is expected to jump by almost 60% to more than 1.5 million tons by 1993, according to Coleman Rowland of Lakeway Research, an Austin, Texas-based consulting firm. Most of this tonnage will come from Mead's new 360,000-tpy machine at Mahrt, Ala., which is scheduled to start up in 1993.

Because of quality and cost advantages, NKB is expected to increase its share of the domestic boxboard market over the next five years. NKB is expected to grow 9%/year, solid bleached sulfate (SBS) shipments are to increase at less than 1%/year, and recycled boxboard may decline by some 3%/year. ■

Session chairmen for the Third International Unbleached Kraft Conference were Conrad Schweitzer, executive vice president, Georgia-Pacific Corp.; Michael R. Harwood, general manager-Containerboard Div., International Paper Co.; Michael Schaefer, vice president-containerboard marketing, Weyerhaeuser Paper Co.; and William H. Swisshelm, senior vice president and general manager, Packaging Corp. of America.

Pulp & Paper's *Fourth International Unbleached Kraft Conference is scheduled for November 1990 in Chicago, Ill.*

OCC CONSUMPTION EXPECTED TO GROW AS COST OF VIRGIN FIBER INCREASES

New technology, equipment can reduce OCC quality variations while new opportunities for building recycled mills increase

By RICHARD A. REESE

Recovery and consumption of recycled corrugated containers is growing at a rapid rate. Table 1 shows changes in consumption that have occurred since 1977. Growth in domestic consumption averaged 1.8% from 1977 to 1982 and 7.5% from 1982 to 1987. Most of the change in consumption has been increased use of old corrugated containers (OCC) in kraft linerboard and semichemical corrugating medium. OCC now comprises about 10% of kraft linerboard and 30% of semichemical medium furnishes. Recycled fiber is the "fortifying fiber" on most semichemical medium machines.

Export tonnage has grown at an even faster rate. The average annual change in export tonnage was 10% between 1977 and 1982 and 23.3% between 1982 and 1987. Collections grew by 2.5%/year between 1977 and 1982 and 9.3%/year between 1982 and 1987. Collections were 40.2% of domestic consumption in 1977, 44.3% in 1982, and 48.8% in 1987. The practical limit for OCC recovery is now likely between 60% and 70%.

ECONOMICS OF OCC CONSUMPTION. Table 2 shows corrugated waste consumption by region. The large consumption in the East north central, Mountain, and Pacific regions is primarily by mills using 100% recycled fiber. The high consumption in the South Atlantic region is mostly by kraft linerboard and semichemical corrugating medium mills. It is obvious that some areas, such as New England, where OCC is available but consumption is low, could be locations for recycled mills.

Figure 1 shows year-end OCC prices in different areas since 1980. The same trends have occurred in all regions. In 1985, relative prices increased significantly on the West Coast due to high demand for export. This change has made it attractive for West Coast consumers to buy OCC from as far away as Chicago, Ill. Figure 2 shows linerboard production for domestic use between 1940 and 1987. Recycled linerboard was 40% of total production in 1940 vs 3% in 1987. Recycled linerboard tonnage fell from 800,000 tons in 1940 to 475,000 tons in 1987. Figure 3 shows corrugating medium production for the same period. This grade was 32% of domestic production in 1940 and 23% in 1987. Corresponding recycled corrugating medium tonnages were 290,000 in 1940 and 1.64 million in 1987.

RECYCLED VS VIRGIN PULP MILLS. Recycled containerboard mills can be competitive with kraft mills as long as OCC prices are reasonable. Two of the largest recycled linerboard mills have cogeneration systems that improve their economic positions.

Capital cost per daily ton is lower for a recycled mill than for a comparable mill using virgin pulp. Cost ranges are from $150,000 to $250,000 for a recycled mill and from $300,000 to $400,000 for a greenfield mill.

Why isn't everyone building recycled containerboard capacity? Containerboard prices have not been high enough until recently to justify new greenfield capacity.

Mr. Reese is OPTEC technical manager, Rust International Corp., Birmingham, Ala. This article is based on a paper presented at the Third International Unbleached Kraft Conference held in Atlanta, Ga., in November 1988.

TABLE 1: **Recycled corrugated consumption in short tons (000).**

	1977	1982	1987
Consumption at U.S. mills	6,205	6,770	9,299
Export	592	887	1,922
Total collected	6,797	7,657	11,221

TABLE 2: **Corrugated waste consumption by region--1987.**

	000 tons	[illegible]
New England	300	[illegible]
Mid-Atlantic	831	[illegible]
East north central	2,426	[illegible]
West north central	325	[illegible]
South Atlantic	1,886	[illegible]
East south central	776	[illegible]
West south central	915	[illegible]
Mountain and Pacific	1,840	[illegible]

FIGURE 1: **Old corrugated prices.**

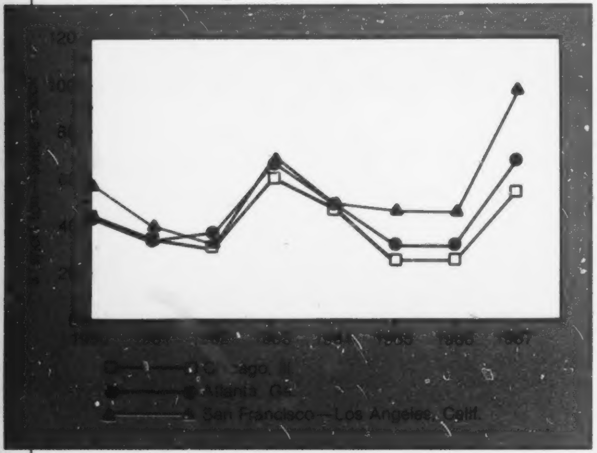


FIGURE 2: **U.S. linerboard production, 1940 to 1987.**

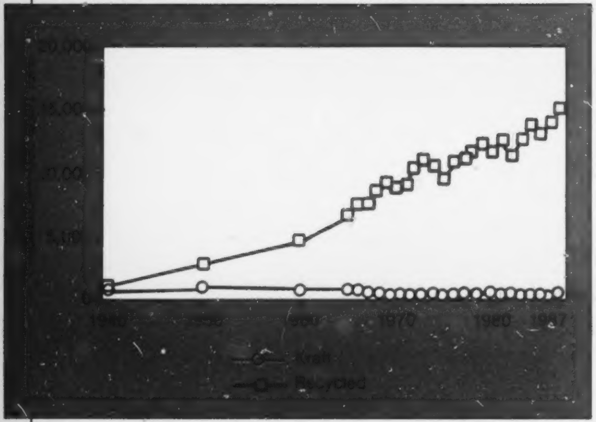
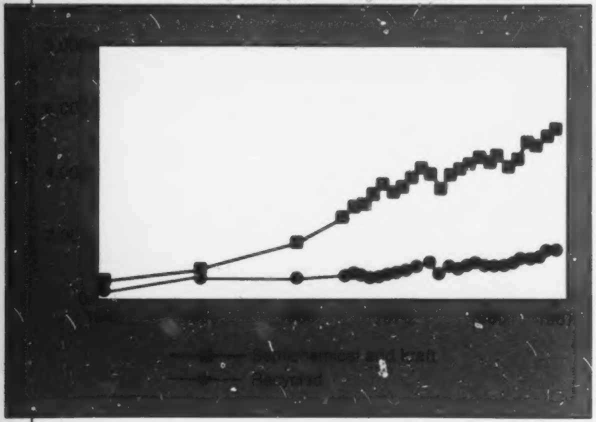


FIGURE 3: **U.S. corrugating medium production, 1940 to 1987.**



The only new greenfield capacity for containerboard in the last ten years has been at International Paper Co., Mansfield, La., and the Inland Container Corp. 100% recycled mill at Ontario, Calif.

New papermaking technology in the forming and pressing areas has made paper machine rebuilds attractive. The high cost of capital equipment encourages optimization and upgrade of existing facilities. Fiber used in many kraft linerboard and semichemical corrugating medium expansions has been recycled fiber.

QUALITY DIFFERENCES. Compared with virgin kraft containerboard, recycled containerboard has inherently lower strength, appearance, and printability/surface characteristics. The differences have greater significance on linerboard than on corrugating medium. Since the latter is sandwiched between linerboard sheets, appearance and printability differences are not really important. Accordingly, recycled corrugating medium has had a much greater acceptance in box plants.

Strength differences can be compensated by wet end additives and/or running a size press. In fact, some recycled mills achieve better compression strength than mills using virgin fiber. Recycled linerboard has a "dull" look rather than the "sheen" look of kraft linerboard. Most recycled mills add dye to the wet end or size press to match the color of kraft linerboard sheets.

Recycled sheets generally do not look as clean as virgin kraft sheets and are characterized by spots of different sizes, color, and shape, depending on the effectiveness of the stock preparation cleaning and screening systems. Some box plants prefer to use recycled linerboard on the inside of corrugated boxes, where sheet appearance is less obvious to users.

Printing ink soaks into recycled linerboard sheets more than into kraft sheets. This leaves printing voids on the surface, which can be objectionable depending on box application. Some manufacturers feel that the greater penetration is related to more short fibers on the surface. Smoothness can also affect print quality.

The presence of stickies in the sheet can cause separate layers of paper in rolls to stick together, in addition to causing appearance problems. Contaminants can restrict calendering as web consolidation tends to flatten the stickies and make them cover a larger area.

The presence of wax and other slippery materials can result in a lower coefficient of friction in finished sheets. This can cause slippage of boxes from stacks and other problems. Some mills apply a silica antiskid material that can cause problems in corrugating plants by coming off on printing plates and reducing cutter blade life. One mill reported a coefficient of friction of 16 to 18 without an antiskid material and 25 to 27 with its application. Effective removal of waxes and other slippery materials can eliminate the need to apply antiskid materials. Some U.S. mills spray silica solution on the web at the dry end of the paper machine.

Recycled containerboard often runs differently on corrugators than do virgin sheets. Corrugating plant operators must adjust operating conditions to achieve good performance. For example, test liner can warp, so more heat must be applied to dry the web. Test liner also will not stand as much abuse on the pressure roll as kraft linerboard. Pressure roll loadings that are 20% to 25% lower must be used when running test liner.

SECONDARY FIBER SYSTEMS. The key to successful production of test liner is delivery of good-quality recycled fiber to the paper machine. Recycled fiber contains several different types of contaminants that must be removed to avoid paper appearance problems. Technology exists to remove virtually all contaminants from recycled fiber. No existing 100% recycled mills have state-of-the-art secondary fiber systems. The challenge is to install and operate a cost-effective system that will provide satisfactory fiber quality.

The major raw material used in recycled containerboard is OCC. Types and levels of contaminants vary depending on the source and end use of OCC. For example, moving boxes are relatively clean and free of contaminants, while boxes used for fruit and produce often have heavy wax treatment to provide a water barrier. Contaminants can include the following:

- Heavyweight materials—metal, grit, wire, sand, ceramics, and rocks
- Lightweight materials—plastics, polystyrene foam, wax, hotmelt
- Adhesives and latex-based stickies
- Other materials—asphalt, shives, chop, bark, and ink.

Average yield of good fiber is 85% on an oven-dry basis. OCC in the U.S. is normally about one-third corrugating medium and two-thirds kraft linerboard. Strength is somewhat lower than kraft pulp since corrugating medium is produced from semichemical hardwood pulp.

European OCC has lower strength and different contaminants than OCC in the U.S. The lower strength is related to the fact that European OCC normally has been recycled four to five times. European OCC generally has less waxes and hotmelts than OCC in North America but higher gross contaminant levels due to plastic bags and other materials. Asphalt is used as a moisture barrier. European mills also use some other grades of wastepaper in test liner, including wastepaper that is both bleached and unbleached, and chemical and mechanical fibers.

Nearly all stock preparation systems include the following:

- Pulpers to break up the bales of waste fiber and put paper fibers and contaminants in a water slurry
- Baggers and junk towers on the pulpers to collect wire, staples, rags, stones, and other large contaminants
- High-density cleaners to assist in the removal of heavyweight contaminants
- Coarse screens (0.078-in. holes) to assist in the removal of relatively large contaminants
- Fine screens (0.014-in. slots) to remove smaller contaminants
- Secondary and tertiary equipment to treat rejects removed from the primary fiber line
- Thickeners to increase stock consistency for storage.

STATE-OF-THE-ART FOR U.S. OCC. A schematic of a basic state-of-the-art secondary fiber system is shown in Figure 4. The system shown is a "removal system" in which each unit operation is accomplished at optimum consistency for efficient removal of contaminants. The system shown in Figure 4 does not include fractionation by fiber length or dispersion. The following are major components and their primary functions:

- Material handling—delivers recycled fiber bales to pulper
- Pulper—separates individual fibers by water dilution and agitation and removes large contaminants, such as wires, staples, rocks, and soda cans
- Pulper detrasher—removes large lightweight contaminants and returns good fiber to pulper
- High-density cleaners—remove smaller heavyweight contaminants, such as stones, short pieces of wire, and coarse grit
- Coarse hole screens—remove relatively large light and heavyweight contaminants
- Medium-density cleaners—remove finer heavyweight contaminants, such as sand and grit
- Fine-slotted screens—remove smaller-scale materials, primarily lightweights
- Through-flow cleaners—remove most lightweight contaminants not removed previously, such as waxes
- Dewatering unit—thickens stock to approximately 12% consistency for efficient storage
- High-density storage—surge capacity between stock preparation system and paper machine
- Reject handling—equipment to remove water from rejected material to minimize landfill hauling costs
- Clarification system—system to remove some contaminants from water to permit recirculation.

KEY GUIDELINES. Proper consistencies for efficient contaminant removal in each operation are as follows:

- Pulper—4% to 5%
- High-density cleaning and coarse screening—3% to 3.5%
- Medium-density cleaning and fine screening—1.5% to 1.8%
- Through-flow cleaners—1%

Recommended barrier opening sizes are as follows:

- Pulper extraction plate—0.5 to 0.7 in.
- Pulper detrashing unit—0.25 to 0.50 in.
- Coarse screens—0.055- to 0.079-in. holes (bar-type cylinders)
- Fine screens—0.010- to 0.014-in. contour slots.

FIGURE 4: **Recycled fiber system modules.**

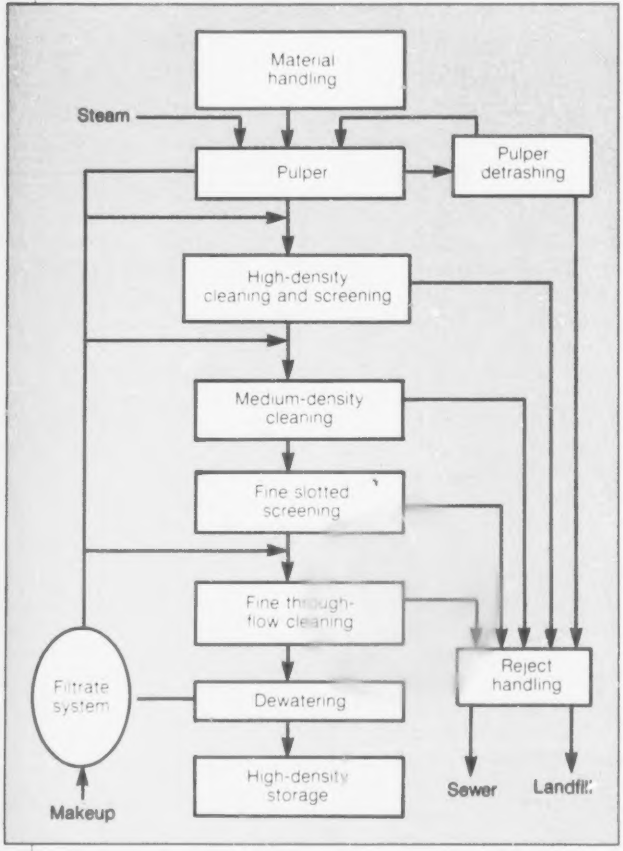
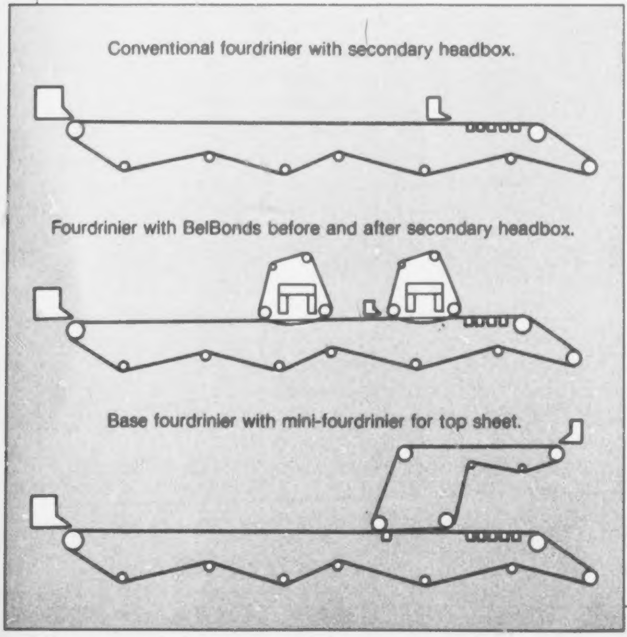

Material handling
Steam
Pulper
Pulper detrashing
High-density cleaning and screening
Medium-density cleaning
Fine slotted screening
Fine through-flow cleaning
Filtrate system
Dewatering
Reject handling
High-density storage
Makeup
Sewer
Landfill

FIGURE 5: **Fourdrinier arrangements on recycled linerboard machines.**


Conventional fourdrinier with secondary headbox.
Fourdrinier with BelBonds before and after secondary headbox.
Base fourdrinier with mini-fourdrinier for top sheet.

Secondary and tertiary screens to process rejects from each stage should have the same opening sizes as primary screens. Medium-density cleaners must be installed ahead of the fine-slotted screens to achieve satisfactory basket life. Medium-density cleaners remove sand and other abrasive materials that cause rapid wear of contour fine-screen plates.

Some suppliers recommend installation of fine forward-flow cleaners ahead of the through-flow cleaners. Others feel that fine forward-flow cleaners should be installed on the paper machine. Machine cleaners would also remove contaminants that enter the system from the paper machine broke system and also from other sources.

Few mills in Europe use reverse or through-flow cleaners. Reverse and through-flow cleaners require close control of operating pressures and consistency to achieve good separation. It is likely that fewer lightweight contaminants in European OCC also contribute to the lack of through-flow cleaner application.

Secondary fiber equipment suppliers say that good test liner appearance can be achieved without a dispersion unit. However, no major test liner mills in North America are operating without dispersion systems. Some kraft linerboard mills claim to be achieving good recycled stock cleanliness with reverse or through-flow cleaners, but they are running relatively low percentages of OCC.

It is difficult to project sheet cleanliness based on laboratory trials since rejects are treated differently in laboratories than in commercial installations. However, a test liner mill is currently installing through-flow cleaners and will shut down its dispersion system.

EUROPEAN VS U.S. SYSTEMS. Most European OCC stock preparation systems are significantly different from that depicted in Figure 4. Most systems operate at consistencies of more than 3% and include fractionation and dispersion systems. High-consistency operation reduces the amount of contaminants that can be removed. Fractionation permits separation of long and short fibers for use in top- and basesheet test liner or use of short fiber on corrugating medium machines.

European systems seem to be based on taking out coarse contaminants at the pulper and detrashing units, high-density cleaning and screening, fractionation, and dispersion of long fiber fraction. These systems generally do not include removal of fine contaminants in cleaners and screens.

A basic system such as that shown in Figure 4, with provisions for stock fractionation at 3% to 3.5% consistency after fine through-flow cleaning and inclusion of a dispersion system between the dewatering unit and high-density storage, appears to have the best potential for U.S. recycled mills. Commercial experience with state-of-the-art systems will determine if dispersion systems can be eliminated.

PAPER MACHINE. Three different forming section configurations are currently used on recycled linerboard machines (Figure 5). Current machines in the U.S. use conventional fourdriniers with secondary headboxes. The fourdriniers are long to compensate for the low freeness and slow drainage rates of secondary fiber furnishes. Slow drainage rates can result in a concentration of short fibers on the top of the basesheet. Low tear and cracking/score problems can be experienced on heavyweight grades, such as 69-lb linerboard. Major U.S. test liner producers are evaluating changes to improve forming section performance.

Top-wire units with vacuum dewatering are installed on some machines in Europe running 100% recycled fiber. Performance is good, and one mill reported concerns with dewatering capacity with top-wire units.

Mini-top fourdriniers are installed on several European test liner machines. This concept includes forming top- and basesheets separately and joining them at a moisture content of about 10%. Overall sheet strength is increased by forming separate lighter-weight plies. One potential problem is low ply bond between the top- and basesheets. Some mills spray starch between the two sheets to improve ply bonding. Good ply bond can be achieved by closely monitoring moisture content of the top- and basesheets at the joining point.

There is some concern that paper machine efficiency will be lower using a top fourdrinier rather than a conventional fourdrinier or a fourdrinier with top-wire units. Some top fourdrinier machines installed in the U.S. have not performed well. Some of the problems experienced have been unique applications and lack of expertise.

A mini-top fourdrinier may be the best choice for a recycled test liner machine. The major reason is better drainage capacity by producing lighter-weight sheets and higher sheet strength. Higher strength will reduce the amount of refining necessary to achieve acceptable strength tests. A conventional fourdrinier with top-wire units would be an alternative selection.

PRESSING. A good press section can consolidate the web and increase mullen and ring crush tests. Recycled stock generally dewaters more easily in the press section than virgin kraft furnishes. Sheet dryness of 3% to 4% higher is typical at comparable press loads. Most paper machine suppliers recommend a double-felted first press followed by a long-nip or wide-nip second press. There are two basic options for good test performance on the last press nip on linerboard machines:

- Long-nip press (LNP). This is a large-diameter-roll, double-felted press with a maximum nip pressure of 2,000 pli. Nip width is 2.5 to 3.5 in.
- Wide-nip press. These presses have nip pressures of 5,500 to 6,000 pli at a nip width of approximately 10 in. The Beloit Extended Nip Press (ENP) has a ceramic shoe with a rubber blanket running between the shoe and the top roll. The Voith Flexonip has a rotating flexible cover on the bottom press roll. The Sulzer Escher Wyss Intensa S design has a concave Nipco shoe inside a flexible roll shell in the bottom position and a standard Nipco roll in the top position.

Wide-nip presses achieve sheet dryness of 3% to 4% higher than long-nip presses. Expected sheet dresses would be about 45% to 47% with an LNP and about 50% to 51% with a wide-nip press using a typical U.S. test liner furnish. The greater dewatering provided by a wide-nip press would permit installation of fewer dryers. This would partially offset the higher capital cost of these units.

SIZE PRESS. One of the key questions from a technology standpoint is whether or not a size press is necessary on a recycled linerboard machine. Most machines producing recycled linerboard have size presses, while machines producing kraft linerboard generally do not have size presses. Size presses generally increase mullen tests 3 to 5 points and enhance ring crush.

One U.S. test liner mill does run a size press. It previously ran a size press and conducted trials a few years ago with and without the size press. Its box plants could not see a difference, so the mill eliminated the size press, allowing higher machine speeds since the sheet was not rewet in the middle of the machine. The mill runs internal cationic starch, which it feels is more cost-effective than operating a size press.

All European test liner machines use size presses, operating with sheet moisture content of 10% to 20% entering the size press. High sheet moisture content improves starch penetration in the sheet, which is necessary to achieve good sheet runability and glueability on corrugators. Some European mills indicated that they could probably run without size presses if they had U.S. quality OCC.

A size press should be included on a new test liner machine installation in the U.S. Size presses enhance ring crush tests, and the growing emphasis on ring crush adds credence to inclusion of a size press.

SUPPORT SYSTEMS. Use of recycled fiber can create some special problems on paper machines. The key parameter is the effectiveness of contaminant removal in the stock preparation system. Most paper machines running recycled fiber have problems with filling on forming fabrics, press felts, and dryer fabrics. Some mills have developed procedures and special equipment to minimize the effects of contaminants on the paper machine.

Recycled fiber is more difficult to dewater on the forming section than virgin kraft. Some mills are running double- or triple-layer forming fabrics to increase dewatering capacity. Special-design press and dryer fabrics are not necessary, but designs that are easy to keep clean should be considered. ■

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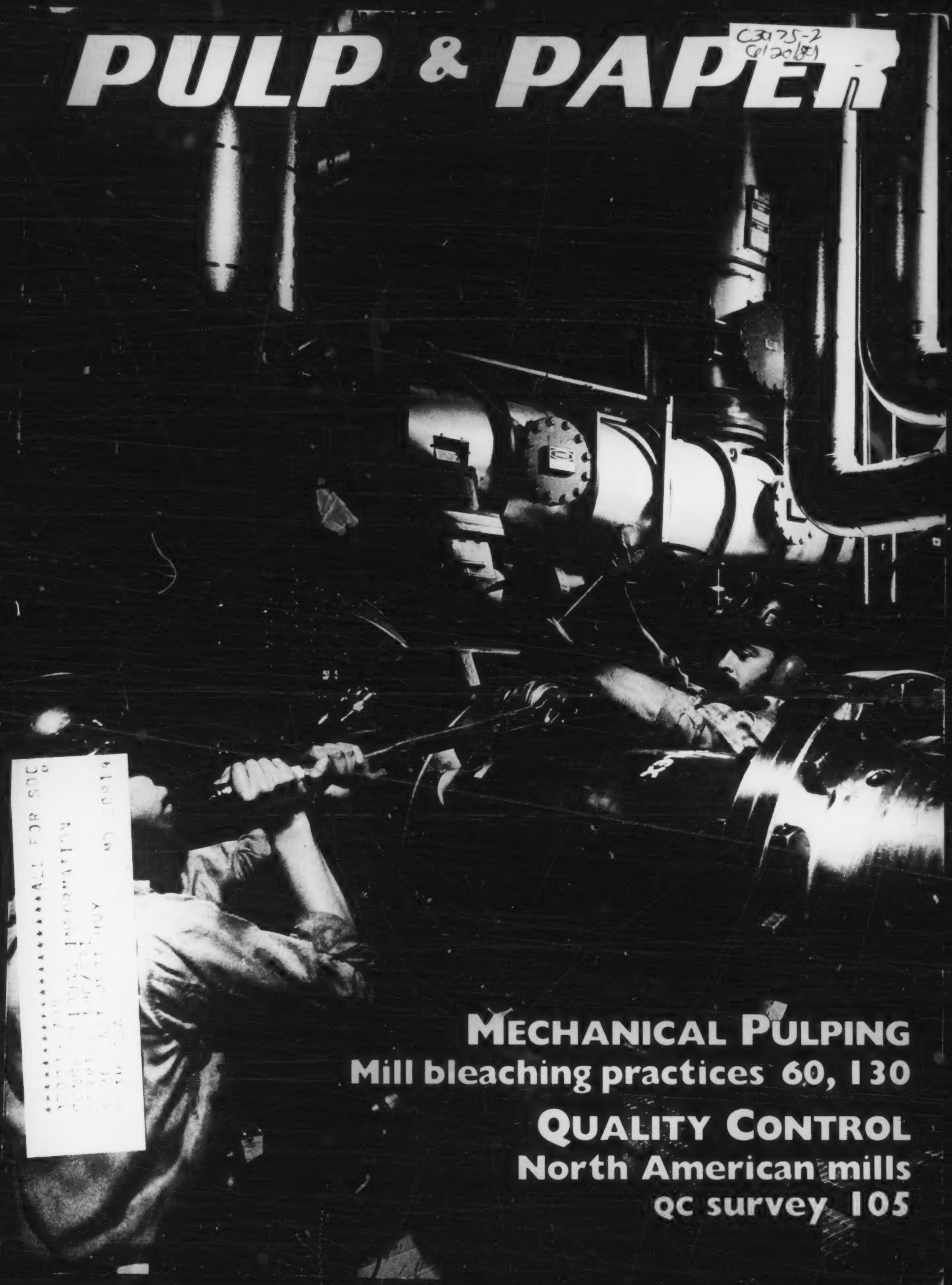
PULP & PAPER



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********ALL FOR SDC

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***This issue's focus on mechanical pulping examines some of the latest equipment installations and bleaching practices in North American mills.* (Photo of coupling connection between 22,000-hp drive motor and 60-in. refiner courtesy of Consolidated-Bathurst Inc.'s Belgo Div. CTMP mill at Shawingan, Que.)**

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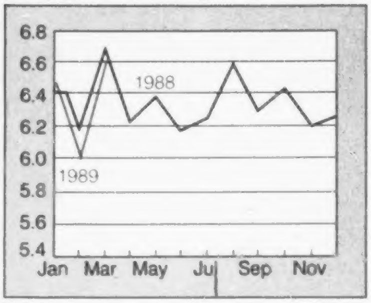
ABP

BPA

MONTH IN STATISTICS

U.S. paper and board production



U.S. production of paper and paperboard totaled 6.6 million tons in March, down 1.9% from March 1988, which had the highest monthly production total on record, according to the American Paper Institute. First-quarter production totaled 19.2 million tons, down 1.2% from first-quarter 1988, but most of the decrease was due to an extra day in February 1988. After seasonal adjustments, the rate of production for the first quarter stood at 77.0 million tpy, down 0.4% from last year.

Among major grades, uncoated groundwood and tissue were the only areas showing gains compared with a year earlier. Fiber box shipments remained relatively healthy, with a 2.4% gain over last year after adjusting for one less day this March.

Canadian newsprint shipments totaled 813,000 metric tons in March, down 7.7% from a year earlier, while operating rates skidded to 94%. According to API, the large increases in Canadian exports to the U.S. in January were due in part to problems caused by the switch to the new Harmonized Code classification system. Instead of the big double-digit increases reported last month, U.S. imports in January declined an estimated 3.7% for Canadian newsprint and rose 11.6% for pulp. ■

		Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION[1]					
Newsprint	Mar.	516	1.2	5,874	-1.3
Uncoated groundwood (s)	Mar.	142	2.2	1,682	6.2
Coated paper (s)	Mar.	592	-9.3	7,101	-5.7
Uncoated free-sheet (s)	Mar.	972	-4.7	11,346	-1.6
Other printing/writing	Mar.	124	-5.3	1,472	-0.3
Total packaging and other paper (s)	Mar.	448	-1.3	5,243	-2.0
Tissue	Mar.	505	6.5	5,629	3.0
Total paper	**Mar.**	**3,299**	**-2.5**	**38,347**	**-1.5**
Unbleached kraft paperboard	Mar.	1,653	-2.5	19,313	-1.4
Semichemical medium	Mar.	508	3.3	5,818	2.6
Bleached paperboard	Mar.	391	2.1	4,448	-1.8
Recycled paperboard	Mar.	743	-3.6	8,748	-2.3
Total paperboard	**Mar.**	**3,296**	**-1.4**	**38,324**	**-0.9**
Total U.S. paper and paperboard output	**Mar.**	**6,595**	**-1.9**	**76,671**	**-1.2**
PULP, WASTEPAPER & FIBER[2]					
Total U.S. woodpulp production	Feb.	4,821	-2.0	61,724	0.9
Market pulp production	Feb.	687	0.1	8,785	2.8
Wastepaper consumption at paper/board mills	Feb.	1,528	-0.1	18,607	0.6
Pulpwood consumption (cords)	Feb.	7,837	1.2	97,170	1.4
CONVERTED PRODUCTS STATISTICS[3]					
Corrugated box shipments (billion ft²)	Mar.	26.755	-1.8	77.283[6]	0.6
Containerboard inventories at U.S. box plants and mills	Mar. 1	2,614	1.0		
INTERNATIONAL TRADE[2]					
U.S. paper imports (including products)	Feb.	1,001	-1.1	12,383	0.9
Imports of Canadian newsprint	Feb.	652	-3.4	8,009[6]	-3.5
U.S. paper exports (including products)	Feb.	524	15.2	5,772	13.5
Exports of unbleached kraft linerboard	Feb.	196	16.7	2,133	10.8
Exports of woodpulp	Feb.	507	14.2	5,784	15.5
Norscan pulp inventories[4]	Mar. 31	760	-5.6		
Norscan pulp operating rates[4]	Mar.	97 %	98 %	100 %	99 %
CANADIAN STATISTICS[5] *(reported in metric tons)*					
Total newsprint shipments	Mar.	813	-7.7	2,307[6]	-3.0
Operating rates	Mar.	94 %	100 %	97 %	100 %
Inventories held by U.S. consumers	Mar. 31	1,422	-6.0		
Other paper/board shipments	Mar.	575	-2.9	1,648	-0.1
Woodpulp shipments (export only)	Mar.	741	-1.1	2,017	0.6
Operating rates	Mar.	93 %	99 %	96 %	97 %

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

Recycled paperboard: New capacity, quality improvements opening markets for producers

Grade structure: Recycled paperboard is made primarily from secondary fiber or wastepaper and is produced on either a fourdrinier, multi-ply, or cylinder paper machine. Grades include folding boxboard, corrugating medium, linerboard, gypsum liner, and core/can/tube stock.

Markets: Market demand for recycled paperboard grades, as measured by their 1989 capacity share, are folding boxboard, 26.8%; setup boxboard, 2.8%; corrugating medium, 19.4%; gypsum linerboard, 14.6%; linerboard, 6.2%; container chipboard and filler board, 0.5%; core/can/tube stock; and other converting grades, 29.7%.

Production/capacity: Production increased 3.1% to 8.771 million short tons in 1988, marking the third successive year of growth. Demand continued to be strong in early 1989, and total recycled paperboard production is even with last year's production trend. Last year, mill operating rates improved because industry capacity increased only 2.2%. Mills operated at about 93% of capacity in 1988, compared with about 92% in 1987. This year, capacity is expected to rise 1.1% to 9.572 million tons while production increases at a 1.2% rate to 8.876 million tons. This will keep mill operating rates at about the same 93% level.

In the past three years, improved markets and the increased concentration of ownership have encouraged capital investments that have yielded about 500,000 tpy of new capacity. Containerboard grades, linerboard and corrugating medium, accounted for the largest gains in capacity. In late 1988, however, Nolichucky Industries Corp. was forced into bankruptcy, shutting down about 180,000 annual tons of recycled containerboard capacity. Nonetheless, the strong demand for recycled paperboard grades, coupled with the increasing need to reduce solid waste, could lead to further capacity additions.

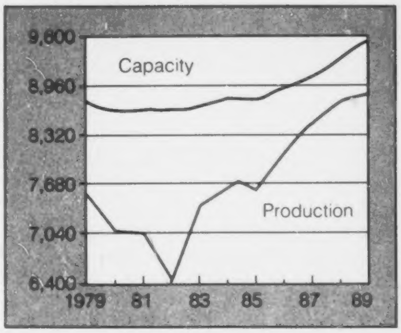
Outlook: Demand for recycled containerboard grades and gypsum liner is expected to weaken slightly in 1989 due to a general slowdown in construction activity and industrial production by the end of this year. Core/can/tube stock should fare slightly better because these grades are used in a variety of consumer packaging applications in addition to their industrial uses. In 1988, recycled medium production increased 9.3% to 1.757 million tons, gypsum liner production dropped 1.0% to 1.201 million tons, and core/can/tube stock production increased 8.1% to 1.255 million tons.

Folding carton and setup boxboard demand should remain healthy this year due to continued strong consumer buying trends. Producers of recycled folding boxboard increased output by 3.5% to 2.475 million tons in 1988, which was a smaller gain than in 1987. The falloff in growth was due more to capacity constraints than a slackening in demand. Mills operated around the clock to meet customers' demand, which was heightened because bleached carton stock was in short supply most of the year. Although demand has eased since last year, folding carton stock remains in short supply and very little new capacity is scheduled to come online this year.

Prices: Prices for recycled folding carton stock improved considerably in 1988. Producers raised prices of clay-coated boxboard grades three times during the year: in February, June, and October. Each increase was approximately $30/ton, and transaction levels rose from $390 to $415/ton at the beginning of the year to $480 to $510/ton at year end. The lower end of each price range represents newsprint-back grades, while the upper end represents kraft-back grades. Plain bending chipboard prices increased to about $340/ton, and white-lined and specialty grades increased to about $435/ton.

Historical prices for clay-coated 20-pt folding carton boxboard (rolls, $/short ton, year end): 1980, $380; 1981, $400/$425; 1982, $380/$425; 1983, $370/$425; 1984, $375/$425; 1985, $350/$400; 1986, $380/420; 1987, $390/415; 1988, $480/$510. Bending 20-pt chipboard (rolls, $/short ton, year end): 1980, $260/$275; 1981, $270/$280; 1982, $280; 1983, $280/$300; 1984, $300; 1985, $300; 1986, $320; 1987, $320; 1988, $340.

SUPPLY/DEMAND *(000 tons)*



FORECAST *(000 tons)*

	1987	1988	1989e
Production	8,506	8,771	8,876
Capacity	9,267	9,468	9,572
Utilization rate	91.8	92.6	92.7
Imports	151	143	120
Exports	60	67	50
Apparent U.S. consumption	8,597	8,847	8,946
lb/capita	71.46	71.85	72.06
GNP ratio[1]	2.26	2.26	2.25

e = Estimate

[1] 1,000 tons/billion $ real GNP.

TOP U.S. PRODUCERS *(000 tpy)*

	Annual capacity	Market share (%)
1. Jefferson Smurfit[1]	1,220	12.7
2. Sonoco Products[2]	750	7.8
3. Newark Group[3]	735	7.7
4. Rock-Tenn[4]	532	5.6
5. Caraustar[5]	525	5.5
6. Inland Container	475	5.0
7. Waldorf	380	4.0
8. U.S. Gypsum	332	3.5
9. National Gypsum	320	3.3
10. Packaging Corp.	210	2.2

Market share of top five companies:
39.3%

Market share of top ten companies:
57.2%

Total U.S. capacity (1989):
9.572 million short tons

[1] Reflects combined operations with Container Corp. of America.

[2] Acquired Federal's Richmond, Va., mill in 1988.

[3] Acquired Federal's Los Angeles, Calif., mill in 1988.

[4] Acquired Mead's Lynchburg, Va.; Cincinnati, Ohio; and Otsego, Mich., mills in 1987.

[5] Acquired U.S. Gypsum's Camden, N.J., mill in 1988.

SALES AND EARNINGS

U.S. companies post 22.2% rise in profits

U.S. paper companies continued to rack up favorable earnings through first-quarter 1989, although profit levels began to slack off somewhat after two years of record results. A *Pulp & Paper* survey of 29 paper companies showed that first-quarter profits were 22.2% over 1988's first quarter, rising to $1.7 billion. Sales of $22.6 billion were 11.9% higher than the year-earlier period.

The strong markets continue to be bleached paperboard and bleached softwood kraft pulp, while printing and writing, tissue, and containerboard grades are in more balanced supply. The only serious weakness was reported in the newsprint market, which is facing a glut of new capacity over the next two years. Overall, most paper companies are confident that the momentum built during the last three years will continue through at least the next quarter and possibly through the year.

International Paper Co. chairman and CEO John A. Georges said that IP's key markets—reprographic paper, containerboard, bleached board, and market pulp—continued to be strong in first-quarter 1989. IP's profits increased 40.3% to $223 million, while sales improved 13.0% to $2.6 billion.

Georgia-Pacific Corp. reported a 45.3% jump in profits to $154 million. The pulp and paper segment bolstered G-P's sales—increasing 15.7% to $2.4 billion, which helped to offset sluggish profits in the building products sector. T. Marshall Hahn Jr., chairman and CEO, said steady demand for the company's key products as well as improved pricing for some grades contributed to the strong performance. Hahn additionally noted that G-P expects operating profits to reach record levels again in 1989, reflecting the full-year contributions of the Brunswick Pulp & Paper acquisition, the new white paper machine at the Port Hudson, La., mill, and the recently rebuilt linerboard machine at the Monticello, Miss., facility.

Weyerhaeuser Paper Co. came in with profits of $148 million—29.1% above the year-earlier period, despite continued lower results in its forest products and building materials business segments that plagued producers last year. Sales for the company were up 8.6% from the year-ago level to $2.3 billion.

Champion International Corp. reported that profits rose 11.3% to $113 million on sales of $1.3 billion. Champion said the higher earnings, attributable to continued improvement in its paper segment, were tempered by downtime caused by machine modernizations and some weather-related problems.

Paperboard makers pleased. Great Northern Nekoosa Corp. posted an increase in profits of 19.2% to $93.3 million on a rise in sales of 16.9% to $986 million. William R. Laidig, chairman, said that GNN "continues to enjoy strong business conditions in most product lines. We increased prices of market pulp and some business papers in the first quarter and again at the beginning of the second quarter."

Union Camp Corp.'s chairman and CEO, Gene Cartledge, noted that in-

U.S. paper industry results.

	Full year ($000)			
Paper companies	**Sales 1988**	**% Change**	**Earnings 1988[1]**	**% Change**
Badger Paper Co. Inc.	$19,466	17.7%	$1,326	105.3%
Boise Cascade Corp.	1,102,220	8.4%	78,250	14.2%
Bowater Inc.	356,680	3.9	38,913	2.5
Champion International	1,288,709	1.8	113,508	11.3
Chesapeake Corp.	187,972	16.5	12,858	29.9
Consolidated Paper Corp.	242,439	4.9	43.410	9.8
Federal Paper Board Co.	284,724	16.0	47,096	115.4
Gaylord Container Corp	178,000	17.8	6,000	−40.6
Georgia-Pacific Corp.	2,447,000	15.7	154,000	45.3
P.H. Glatfelter	155,421	142.	24,386	32.8
Great Northern Nekoosa	986,400	16.9	93,300	19.2
International Paper Co.	2,600,000	13.0	223,000	40.3
James River Corp. (1/24)	1,400,000	16.7	59,000	20.4
Jefferson Smurfit Corp.	319,833	2.2	34,909[2]	7.7
Kimberly-Clark Corp.	1,421,800	9.9	103,100	10.5
Louisiana-Pacific Corp.	467,000	12.8	39,900[2]	41.0
Mead Corp.	1,128,900	4.0	52,600[2]	−20.1
Mosinee Paper Corp.	58,780	−0.3	3,646	122.9
Pentair Inc.	274,800	41.4	9,000	1.1
Pope & Talbot Inc.	147,503	27.5	9,437	18.6
Potlatch Corp.	297,375	15.2	35,912	35.5
Scott Paper Co.	1,268,900	12.7	86,500	16.9
Sonoco Products Co.	433,134	15.1	24,573	10.4
Stone Container Corp.	1,127,400	27.9	86,800	32.9
Temple-Inland	462,600	8.7	54,500	19.5
Union Camp	706,226	9.4	79,718	18.0
Westvaco Corp. (1/31)	554,600	10.6	48,700	29.5
Weyerhaeuser Paper Co.	2,321,292	8.6	148,087	29.1
Willamette Paper Co.	437,816	8.2	39,793	−1.4
Total	**$22,676,990**	**11.9%**	**$1,750,896**	**22.2%**

1. Income after taxes, from continuing operations, excluding most significant nonrecurring items in both years.
2. **Jefferson Smurfit:** Data includes preferred stock dividends received on an after-tax basis from 50%-owned affiliate Container Corp. of America. **L-P:** Year-ago figures restated to reflect spin-off of Fibreboard Corp. in June 1988. **Mead:** 1988 income includes $11.2-million gain from sale of recycled board business.

creased paper products shipments as well as significantly higher selling prices helped boost the company's earnings 18.0% to $79.7 million. Sales improved 9.4% to $706 million from the same period a year earlier.

Gaylord Container Corp. was one of the few companies to show a decline in profits for its second quarter ended Mar. 31. Earnings dipped 40.6%, reflecting mill downtime for capital investment and maintenance at the Bogalusa, La., and California mills. Sales, however, were up 17.8% to $178 million.

Federal Paper Board Inc. reported that profits surged 115% to $47 million over the year-earlier period, and the company racked up a 16% increase in sales to $284 million. John R. Kennedy, president, said the gains reflect a rise in volume as well as favorable pricing for bleached paperboard and market pulp.

Publication paper gaining. Mead Corp. reported its first-quarter earnings dropped 20.1% to $52.6 million. Chairman and CEO Burnell R. Roberts noted that the paper division performed "particularly well" during the quarter, boosting sales 4% to $1.1 billion. Roberts attributed the growth to a significant improvement in earnings from Mead's Chillicothe, Ohio, mill.

Still prospering from the market's protracted boom, Boise Cascade Corp. reports that its first-quarter net income climbed 14.2% to $78 million. Revenues rose 8.4% to $1.1 billion. The largest segment of the company's paper operations, uncoated white paper, continued to show good strength, said chairman and CEO John B. Fery.

John A. Luke, pres. and CEO of Westvaco Corp., expects the strong sales and earnings it achieved for its first quarter ended Jan. 31 to continue into the second and third quarters. "We will make significant capital investments in three of our large paper machines and do a substantial amount of work on one of our largest recovery boilers," he said.

Tissue results strong. Despite still-rising fiber costs, James River Corp. posted a 20.4% jump in earnings to $58.9 million on sales, up 16.7% to $1.4 billion for its third quarter.

Scott Paper Co. said the tissue segment of its U.S. personal care and cleaning business had record profit growth of 24%, which helped boost company profits 16.9% to $86.5 million. Company revenues rose 12.7% to $1.3 billion. ■

Canadian profits sink 14.1%; strong currency blamed

Predictions of an industry downturn in 1989 began to come true for many Canadian forest products companies in the first quarter as profits plummeted 14.1% on a 0.5% drop in sales. Producers attributed the decline to a rising Canadian dollar, which, relative to the U.S. dollar, was about 5¢ higher than it was in the same quarter a year ago and to a weak newsprint market.

The newsprint market has been suffering since last spring from declining consumption and anticipation of new machines starting up over the next several years. This has led to widespread industry price discounting. The weakness in newsprint, however, was partly offset by continued strong demand and rising prices for market pulp. Most companies also reported higher income from fine paper and paperboard operations, while results from wood products were mixed.

Noranda Forest Inc. reported that its profits dropped 7.9% to C$58 million during the first quarter. Sales, however were just under $1.2 billion—up 3.4% from a year ago. The decline in newsprint and lumber margins was largely offset by gains in pulp, printing and writing paper, and paperboard. Pulp markets remained tight, and printing and writing paper shipments and prices remained firm despite some decline in order backlogs. Adam H. Zimmerman, chairman, said Noranda's outlook for the rest of 1989 is positive, as operations are running "exceptionally well" and markets for its products are "generally in good shape."

Abitibi-Price Inc. suffered a drop in earnings of 40.24%, which chairman and CEO Bernd K. Koken attributed to downward pressure on newsprint prices, shrinking margins, and inflationary cost increases that "are greater than Abitibi has experienced in six years." However, Koken said that "while prices stink, business has been pretty good," adding that sales volumes improved 1.3% over first-quarter 1988 to C$810 million. Although earnings of the Diversified Group are close to those of a year ago, the Printing Papers Group earnings suffered a setback in first-quarter 1989 as a result of a production problem at one mill early in the year.

Strong pulp and containerboard markets and a high demand for specialty lumber in offshore markets helped bolster MacMillan Bloedel Ltd.'s earnings but couldn't offset the stronger Canadian dollar and softening newsprint market. MB's profits

Canadian paper industry results.

	First-quarter earnings (C$000)			
Companies	Sales	Change 1989/88	Earnings[1]	Change 1989/88
Abitibi-Price Inc.	$810,000	1.3%	$26,300	−40.2%
Canadian Pacific	711,000	−3.4	65,100	−12.4
Canfor Corp.	202,000	−31.5	30,200[2]	4.1
Cascades inc.	162,187	7.2	5,113	−12.0
Domtar Inc.	695,000	3.3	26,000[2]	−29.7
Donohue Inc.	165,700	6.3	14,500	−4.0
Fletcher Challenge	335,600	−5.8	36,100	−20.5
MacMillan Bloedel Ltd.	807,000	1.3	73,400	−19.9
Noranda Forest Inc.	1,200,000	3.4	58,000[2]	−7.9
Repap Enterprises Inc.	264,100	3.1	24,700	36.5
Scott Paper Ltd.	82,513	0.7	4,241	7.5
Tembec Inc. (9/31)	62,784	21.0	8,168	100.6
Weldwood of Canada	194,400	−6.9	16,200	4.5
Total	**$5,692,284**	**−0.5%**	**$388,022**	**−14.1%**

1. Income after taxes, from continuing operations, excluding most significant nonrecurring items in both years.
2. **Canfor:** Net sales reflect equity accounting for the 50% interests in Howe Sound Pulp & Paper and Canfor-Weldwood Distribution. **Domtar:** Year-ago figures have been restated to account for the sale of a high-pressure laminates business. **Noranda:** Year-ago figures restated for an accounting change.

dropped about 20% to $73.4 million on sales of $807 million. Ray Smith, MB president and CEO, noted that the newsprint market is showing signs of softening and net mill returns are down from 1988, although the company's order files are full. In addition, escalating costs and adverse weather conditions that affected British Columbian logging activity contributed to the decline. "As the economy slows, we're confident that investments we've made over the past few years . . . have equipped us to respond to any future market downturns," Smith said.

Canadian Pacific Forest Products Ltd. posted a 12.4% decline in earnings to $65.1 million on sales of $711 million. The company is particularly vulnerable to the fluctuations of the Canadian dollar, as more than half of CPFP's sales are made in U.S. dollars. The company noted that a buoyant pulp market somewhat offset the profit decline.

Domtar Inc. said its decline in earnings was due to the higher-level interest expensed rather than capitalized following the start of commercial production at its Windsor, Que., facility. The company's profits dipped 29.7% to $26 million, but sales improved 3.3% to $695 million.

Fletcher Challenge Canada Ltd. president Ian Donald said that a weaker demand for newsprint because of increased world production and slower wood products markets means "net profits will be below the record performance we achieved last year." The company reported a 20.5% decline in profits to $36.1 million on a 5.8% drop in sales. ■

MARKET PULP

Celgar Pulp studying plan to double capacity

Celgar Pulp Co. said it was considering a major investment in its 560-metric-tpd bleached softwood kraft market pulp mill in Castlegar, B.C., that would double capacity and upgrade pollution controls. The mill is a joint venture of China International Trust & Investment Corp. (CITIC) and Power Consolidated (China) Pulp Inc. (a 50:50 venture of Consolidated-Bathurst Inc. and Power Corp.)

Part of the work would involve installation of an oxygen delignification pulping system and other environmental improvements in addition to work related to the expansion. A final decision on the project, which is expected later this year, would depend on obtaining financing, fiber supplies, and government permits, the company said.

Lorne Parnell, project director for Consolidated-Bathurst, said the parameters of the project are being reviewed and should be determined by the beginning of the fourth quarter. H.A. Simons has been hired to do the definition study.

Parnell said the Celgar project would not affect the company's continued interest in pursuing a paper mill project in People's Rep. China or the U.S.S.R., although neither is likely to go ahead soon. Consolidated-Bathurst has been interested in ventures in these two countries since 1987. CITIC acquired its interest in the Celgar mill for C$50 million, but the mill was worth more than C$120 million, according to the Chinese agency's 1987 annual report. CITIC's share in the joint-venture was financed entirely through the Royal Bank of Canada. ■

Takema proposes 190,000-metric-tpy BCTMP mill

Takema Forest Products Ltd., a northern British Columbian wood products producer, has asked the province for timber harvesting rights in the Fort Nelson region to supply a 190,000-metric-tpy bleached chemi-thermomechanical pulp (BCTMP) mill, according to the province's Ministry of Forests. The estimated C$195-million project is being reviewed, and a decision is expected to be announced by midsummer.

Takema has asked the province for 315,000 m³ of coniferous pulpwood plus 350,000 m³ of aspen timber. The company has some timber rights and a sawmill/plywood operation near Fort Nelson (which is also the firm's headquarters) that would supply the new mill with chips. If all goes well with the project, startup is slated for 1993. ■

Donohue Matane pulp mill construction progressing

Donohue Matane Inc. is moving forward with construction of a 190,000-metric-tpy bleached chemi-thermomechanical softwood pulp mill in Matane, Que., with the foundation work expected to begin soon. Recently, five sawmills that will supply the main part of the fiber base for the mill were purchased from Les Bois de L'Est du Quebec (1986) Inc., which is a 50%-owned subsidiary of Rexfor, a Quebec government forestry agency.

Rexfor and Donohue Inc. are equal partners in the Donohue Matane project, which is expected to cost approximately C$290 million, C$250 million of which will spent on mill construction, according to Denis Hamel, first vice president of Donohue. Donohue and Rexfor each have subscribed $35 million in common shares in addition to an issue of C$25 million of preferred shares that are held by Rexfor. An eventual participation of a third partner is not excluded, but potential candidates have not yet been identified. To finance the project, arrangements have been made to borrow C$140 million through a syndicate of financial institutions led by the Toronto Dominion Bank and Caisse Centrale Dejardins.

In addition, a total of about C$63 million in aid is being supplied by three levels of government to create an industrial infrastructure, including water supplies, fire protection, and waste treatment facilities. This includes C$24.5 million from the federal coffers, C$32.8 million from the provincial purse, and C$5.9 million from Matane's budget.

Hamel indicated that work on the mill would continue through the fall, when buildings are expected to be finished so that work can be switched to the inside in winter. Equipment installation will begin next January or February, and the mill should be operational by October or November 1990, he noted.

Several pieces of equipment have been ordered, including eight 12,000-hp, 64-in. single-disc refiners from Hymac; bleaching chemical preparation equipment from Du Pont Canada; bleaching equipment from Hymac and Ingersoll-Rand; pulp flash dryers from Flakt; slab presses from Sunds Defibrator; and pumps from Allis Chalmers. ■

Weyerhaeuser upgrading Cosmopolis pulp mill

Weyerhaeuser Paper Co. will start up a $9-million oxygen bleaching system at its 400-metric-tpd dissolving and specialty sulfite pulp mill in Cosmopolis, Wash., by March 1990. This will reduce the mill's use of chlorine by as much as 80%, resulting in cost savings while enabling the mill to meet stringent pollution abatement standards being considered by government agencies.

At the moment, the issue facing Cosmopolis is passing state-ordered toxicity tests, which the mill has failed four times recently. Work on the new oxygen delignification system has already begun. When it is started up next March, trials will be run for customer evaluation. Product testing will continue until March 1991, and the mill will have the option of using the existing bleaching system, noted Bob Devones, mill technical director.

No downtime is expected, as tie-ins of the new equipment will be made during scheduled maintenance shutdowns. ■

CAPITAL SPENDING

Paper industry spending to exceed $15 billion

The Dept. of Commerce's latest capital spending survey reveals that paper companies continue to lead all other U.S. manufacturing industries in their projected increase in capital spending for 1989. Conducted during the first quarter, the survey found that paper companies plan to spend $15.21 billion (current dollars) on new plant and equipment this year. This is an increase of 35.4% from the revised 1988 spending level.

In the October/November survey, paper companies said that they were planning a 28.3% increase for 1989. Spending rose 24.7% between 1988 and 1987 (1.8% lower than what the respondents estimated they would spend at the beginning of 1988). Annualized, seasonally adjusted spending by the industry for third-quarter 1988 was $11.37 billion; fourth quarter, $12.53 billion; projected first quarter, $15.47 billion; and projected second quarter, $14.56 billion, Commerce reports.

The paper industry's 35.4% increase compares with a 9.6% increase planned for all nondurable goods manufacturers. The paper industry was more bullish on its spending plans for the first two quarters of this year than it was in its October/November survey. ■

Capital spending plans of some U.S. paper companies (millions of dollars).

Company	1987	1988	1989
Boise Cascade Corp.	$259	$452	$700
Bowater Inc.	$88.1	214.3	360
Champion International	334	571	850
Chesapeake Corp.	38.8	72.2	145
Federal Paper Board Co.	179.8	204.3	425
Georgia-Pacific Corp.	550	711	630
Great Northern Nekoosa Co.	250.3	282.4	500
International Paper Co.	603	645	900
James River Corp. (Apr. 30)	509	623	675
Kimberly-Clark Corp.	247.3	438.2	2,000*
Mead Corp.	175.3	350.4	650-700
Potlatch Corp.	155.2	114.3	209.5
Scott Paper Co.	380.1	508.7	1,450*
Stone Container Corp.	106	137	455
Union Camp Corp.	192	359	600-650
Westvaco Corp.	280	393	500
Weyerhaeuser Paper Co.	621	860	825
Willamette Industries Inc.	129	278	n.a.

p = Projected. n.a. = not available
*Projected 1989-90 spending.
Source: Annual reports.

Canadians plan 45% jump in spending for 1989

According to a report recently published by Statistics Canada entitled *Private & Public Investment in Canada*, the Canadian paper and allied products industry plans capital expenditures of C$5.28 billion in 1989. This is a 45.0% jump from last year's spending of $3.64 billion and exceeds the 35.4% increase in spending that the U.S. industry has slated in 1989, according to the latest Dept. of Commerce survey.

About 11.6% of this year's spending will be for construction, with the rest going to new machinery. Spending on repairs is expected to total $1.76 billion—a 2.9% increase over 1988.

Capital spending by pulp and paper mills in Quebec is forecast to increase by 48.1% to $1.55 billion. Spending by Ontario mills is forecast to rise 43.5% to $946.5 million. British Columbian mills anticipate they will spend $1.35 billion—up 75% from 1988. ■

UNCOATED GROUNDWOOD

Fletcher ventures into soft calendering in West

Fletcher Challenge Ltd. announced last month it will upgrade No. 2 newsprint machine at its Elk Falls, B.C., mill to soft-roll calendered paper production, making it the first to use this relatively new technology in western North America. This will initially offset production of about 20,000 metric tpy of newsprint but is likely to expand to about 60,000 tpy or more in three years, noted Ian Donald, president and CEO.

The C$33-million modification to No. 2 machine, a 130,000-tpy unit, has already begun and should be completed by mid-1990. Kleinewefers is the major equipment supplier. The project is the third phase of a C$60-million modernization of the Elk Falls mill. A C$17-million thermomechanical pulp peroxide bleaching plant started up in late May. July should see the completion of an $11-million revamp of some papermaking equipment that will allow for the addition of clay fillers in groundwood specialties paper production.

The technology for using twin pairs of soft calenders to make a pa-

BCTMP startups boost pulping, bleaching chemicals

CONSUMPTION. Mechanical pulp production rode the industry tide to record highs. Many of the chemical firms that supply this market met with success. The good news can be attributed to hungry pulp markets, the acceptance of bleached chemithermomechanical pulp (BCTMP), and a continuance of the fierce competition in groundwood-based-paper-grade markets.

In 1988, an additional 710,000 metric tpy of BCTMP was introduced in Canada. Another 750,000 metric tpy is tentatively scheduled through 1991. These products were required to compete with other market pulps on optical and strength specifications. Chemicals like sodium sulfite, sodium hydrosulfite, and hydrogen peroxide were called upon to meet these quality demands.

Hoechst Celanese reports new consumption highs of their V-Brite Proprietaries line. Thermomechanical pulp producers are using more to get higher brightness than might be obtained with the same species used in other groundwood processes. High-concentration products are also growing. Both existing and new systems are employing it to upgrade or maintain groundwood paper product lines, which are becoming brighter, stronger, and capable of meeting the challenges coming from innovative pressroom developments.

Versene chelating agents and metal-ion control systems reached record levels in 1988 as producers became more familiar with their processing advantages, such as higher brightness efficiencies in mechanical pulp peroxide bleaching, reduction of downtime in digesters, and improvement in hydrosulfite bleaching economics. The addition rate varies with specifications but falls between 1 to 6 lb/ton while helping to eliminate sodium silicate requirements and to bump brightness up a few points.

The real star in BCTMP growth has been hydrogen peroxide, having risen 25% in consumption in North America from 1987 to 1988. This year's forecast is anticipating similar results. The major producers—Du Pont, FMC, Interox America, Atochem, and Degussa—all report high operating rates and great success in the BCTMP market. Consumption rates at BCTMP sites are a function of the species, equipment used (medium-consistency and high-consistency processes), brightness target (75% to 85% ISO), and process efficiency. Typical addition formulas involve peroxide charge, sodium silicate for stabilization, and caustic for alkalinity, with options on sodium hydrosulfite and metal-ion inhibitors. Sources all see an emerging technology for onsite production of hydrogen peroxide. Du Pont is developing a system that could produce up to 8 tpd.

PRICE, AVAILABILITY. New capacity of hydrogen peroxide is on the way. Interox America will open its Longview, Wash., facility late in 1989 (45 million lb/year). Interox reported an industry operating rate of 90% of effective capacity, which will create tight supply situations during second-half 1989. As a result, prices should move up later this year. One supplier mentioned that any unplanned shutdown of hydrogen peroxide capacity would have a significant impact on the market. Another contact discussed producer cost impact. Hydrogen peroxide suppliers are also facing higher production costs, new plant investment, and greater R&D outlays.

Most contacts did comment on a possible recession. Du Pont mentioned that it remains optimistic about peroxide, given the industry's concern about chlorine use and the cost-competitiveness of BCTMP. Du Pont stays abreast of developments through its Pulp & Paper Network. Sometime this year, it expects to announce new and improved bleaching technologies for pulp manufacturers. FMC is also marketing the EOP process for chemical pulp bleachers, in addition to its Pulp Brite technology currently being offered to mechanical pulp producers for brightness and strength improvements in processing. FMC will start up a 66-million-lb/year plant at Prince George, B.C., in early 1990.

V-Brite will be more expensive this year. A first-quarter increase was announced for the U.S. and eastern Canada at \$0.03/lb, and another similar increase is scheduled for late second quarter. Olin, producer of Reductone and Hydrolin, also boosted prices \$0.035/lb in March.

Dow Chemical is releasing a new chelating agent (XUS-11111) for kraft mill digester application. Metal-ion control systems are also being looked at. Pressure on raw materials could force a price increase down the road.

For sodium silicate, PQ says availability is market. But the upward price spiral of alkali and energy costs could require a minor price adjustment. The company recently expanded its Tacoma, Wash. facility by 50%.

TABLE 1: **Consumption and price of mechanical pulping and bleaching chemicals.**

	Pulp industry consumption	Change 1989	Price change 1989
Hydrogen peroxide[1]	125 million lb	20%	5% to 10%
Sodium hydrosulfite	32,000 tons	2.5%	5% to 10%
Sodium silicate	80,000 tons	9%	0% to 5%
Sodium sulfite	135,000 tons	15%	5% to 10%

[1] Consumption source: FMC Corp.

ISSUE FOCUS: **QUALITY CONTROL**

MORE PAPER MILLS INSTALL SPC/SQC AS QUALITY REQUIREMENTS INCREASE

Survey shows 74% of mills in North America have begun or are implementing programs to improve product quality, consistency

By KELLY H. FERGUSON, Projects Editor

Most managers agree that quality control is an ever-evolving process. This is particularly true in the North American paper industry, where change has always been rather slow and methodical. But in recent years, many mills have stepped up their quality improvement efforts, overhauling existing programs and installing new statistical tools to better understand and control the manufacturing process.

A recent *Pulp & Paper* survey of selected pulp and paper mills in North America shows that the industry is increasing its emphasis on making a quality product, but most mills feel they have a long way to go to achieve their own quality goals. As one fine paper mill respondent said, "We still have more to do. Quality improvement requirements are never ending. What we have accomplished is only the beginning."

THE STATUS OF QUALITY. *P&P*'s survey showed that all mills have some type of quality program, ranging from a lab inspecting variables of the finished product to extensive process monitoring throughout the entire mill. Responses to many questions indicated confusion on what exactly is meant by "quality" and how it is achieved. In discussing the survey results, and based on past quality upgrades at mills, focus was put on statistical process control (SPC)/statistical quality control (SQC) programs.

To focus the discussion even more, SPC/SQC was defined as making a consistent quality product that meets certain standards set by either a mill or its customer. In a special report on quality in 1987, *P&P* predicted that "almost every pulp and paper manufacturer has begun or will implement an SPC/SQC program" (*P&P*, Apr. 1987, p. 69).

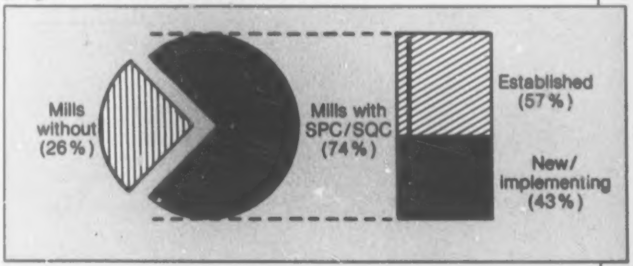
Of the mills responding to the current survey, 74% indicated they were using SPC/SQC programs. Of those respondents, 43% said they were currently implementing or were in the early stages of SPC/SQC (Figure 1). Those numbers closely correspond to a similar mill survey recently conducted by Huyck Felt, Wake Forest, N.C., which showed 52% of respondents using SPC/SQC and 39% planning to implement SPC/SQC as part of their quality programs. Surprisingly, about 10% of Huyck's respondents said that at this time they had no plans to implement SPC/SQC.

SPC/SQC IN THE MILL. Almost all *P&P* respondents (93%) felt SPC/SQC was the wave of the future. A respondent from a West Coast tissue/specialty mill said, "SPC is one tool that can be used to improve process efficiencies and reduce waste. Those who ignore it will not be able to remain competitive." Another West Coast mill respondent noted, "From everything that I've seen, SPC/SQC is an excellent tool and should survive as the means to describe and control quality performance in the future."

Yet some respondents felt the use of such programs had taken on a faddish aspect, an opinion represented by a Midwestern mill respondent who said, "It is being treated as a fad in terms of media hype, but if we fail to adopt participative management, we are doomed to second-rate status in the world economy. SPC/SQC is just a small part of the participative approach. It will not support itself."

Another respondent said, "I feel it should be the wave of the future but am not sure it will be. The Japanese may force us to embrace SQC in a wholesale manner to stay competitive. My guess is that some of the techniques will be adopted, but the necessary cultural

FIGURE 1: **Almost three-quarters of the mills responding have SPC/SQC programs, and of that 74%, the majority claim those programs are well established in the mill.**



changes will not be adopted and the full benefits of SQC will not be realized."

P&P's survey showed that all mills have some type of quality program, ranging from a lab inspecting variables of the finished product to extensive process monitoring throughout the entire mill.

From the respondents' discussions of their SPC/SQC programs, it seems that the two key factors in a mill's decision to implement SPC/SQC are the grades produced and the commitment of management. As would be expected, most fine paper mills (83%) already have an established SPC/SQC program.

A high percentage of market pulp and paperboard mills (about 80%) also have programs, particularly solid bleached sulfate (SBS) and high-grade bleached chemical pulp mills. About three-fourths of the specialty paper mills and a little more than half of the containerboard mills (including several recycled facilities) have similar programs. Not enough tissue or newsprint mills responded to the survey to allow the calculation of a meaningful indication for these grades.

Of the mills having SPC/SQC programs, 61% said mill management was very involved and supportive of the program. Figure 2 shows the level of involvement by management. A southern mill respondent said, "There is absolutely no way we would have made the progress we have seen during the last seven years without the ongoing help and active support of both the departmental and mill management."

A Canadian mill respondent, however, showed how the mill's management forced the SPC/SQC program to break down: "After some early successes, the program fell away because most of the planned improvements required process changes and capital equipment."

One factor that appeared to have no effect on implementation was mill size. No correlation could be made between the size of the responding mill and the level of its involvement in SPC/SQC. Of the larger-size mills (1,500+ tpd), some did not have an SPC/SQC program in place and had no current plans to implement one, but some of the smaller mills (100 to 500 tpd) were implementing or were in the early stages of SPC/SQC.

Cost was an important consideration for 12% of the respondents in the Huyck survey. This factor was specifically cited by most of the 10% who said they had no plans for installing SPC/SQC at their mills. Up-front costs typically include training, temporary help (to allow time for training), and increased product rejects. However, most mills say these costs are not significant, particularly when considering the potential gains.

FIGURE 2: **Most company management is heavily committed and involved in mill quality improvement programs, such as SPC/SQC.**

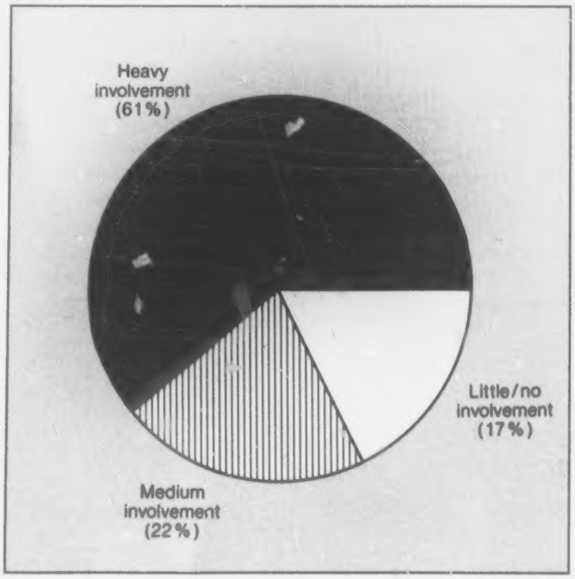
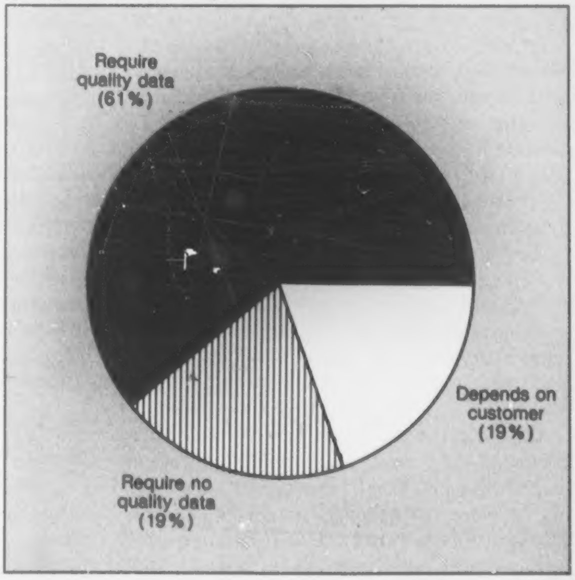


FIGURE 3: **While converters and end users do not require mills to have SPC/SQC programs, most do require mills to present some quality data about their product.**



THE SPC/SQC CHAIN. In *P&P*'s 1987 quality report, a chain was discussed in which suppliers would be required to implement SPC/SQC programs, just as mills were being required to do by converters and end users. According to the respondents in this survey, end users may not be *forcing* SPC/SQC on mills, but 61% of the respondents said they must present some kind of quality data, and 19% said it depends on the particular customer (Figure 3). Data required of mills includes, among other things, average test data, control charts on specific attributes, basis weight, caliper, moisture, and evidence of an SPC/SQC program.

A 310-tpd recycled paperboard mill that has an SPC/SQC program said its customers "currently require only the raw data [basis weight, caliper, moisture] in raw form. In the near future they will be requesting control charts."

At the other end of the chain, only 16% of respondents in the *P&P* survey said they require their suppliers to have SPC/SQC programs. However, comments by respondents suggest that, in general, they do require some kind of quality information. The Huyck survey indicated that papermakers are somewhat more demanding of their suppliers, with 32% reporting that vendors must have or be in the process of initiating an SPC program. Some 48% of the Huyck respondents said vendors that use SPC/SQC will usually be chosen over those who do not.

A southern specialty paper mill respondent to the *P&P* survey said, "We require SPC/SQC of all our suppliers and are currently working with our chemical, woodpulp, and clothing suppliers in a formal vendor relations program. We do formal vendor ratings and use the ratings in determining vendors and market share." A survey respondent from another southern mill commented, "Most major suppliers seem to be emphasizing quality control, although some may be using it only as good public relations, while others are actually implementing it."

SPC/SQC reference material

Most of the *Pulp & Paper* survey respondents, when asked what reference sources they use in their SPC/SQC programs, gave extensive lists of works they considered valuable. Obvious ones included works by Deming, Juran, and Crosby. Not all of their choices could be listed. The following works, however, were mentioned repeatedly:

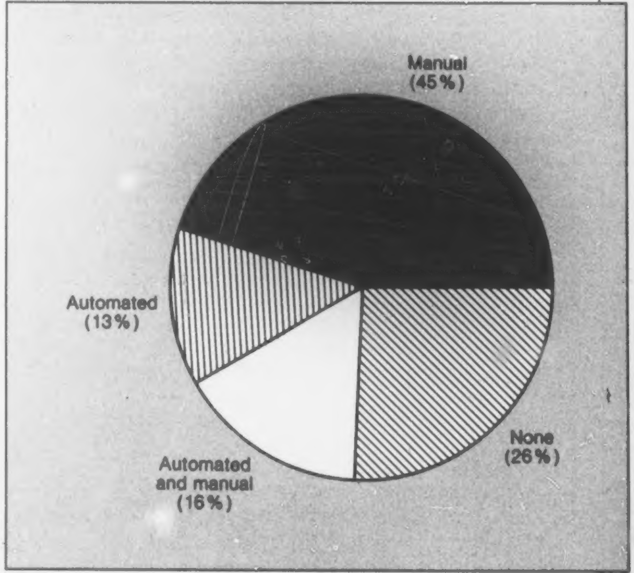
- Grant and Leavenworth's "Statistical Quality Control"
- Scherkenbach's "The Deming Route to Quality and Productivity"
- Materials from the Univ. of Tenn.'s Institute for Productivity through Quality
- Stone Paper Co.'s SPC manual
- Various materials from Tennessee Associates International
- Messina's "Statistical Quality Control for Manufacturing Managers"
- Peters' "Thriving on Chaos"
- Juran and Gryna's "Quality Planning and Analysis"
- Ishikawa's "Guide to Quality Control"
- Fellers' "SPC for Continuous Processes."

Respondents to the *P&P* survey said their mills require various data from suppliers, including assurance of product consistency, information on key properties, individual tests on shipments of chemicals, furnish averages, and control charts. Most respondents said suppliers were generally cooperative in offering required data.

Comments from the respondents show that many are beginning to investigate the requirement of SPC/SQC programs by suppliers, and some say their suppliers already have programs in place. Federal Paper Board Co.'s Riegelwood, N.C., mill, one of the first to use SPC/SQC in the paper industry, has a different approach to working with chip suppliers. "Since many of our purchased chip suppliers are small operations, we have tended to do much of the statistical analysis for them. We then work with individual suppliers to correct problems that are uncovered by our purchased chip quality improvement program."

SPC/SQC PROGRAM BASICS. The *P&P* survey included a number of questions on the basics of the quality programs in the mills. Organization of quality pro-

FIGURE 4: **A majority of mills use manual control charts or both automated and manual techniques. However, a surprising number do not use control charts at all.**



grams was one area where most mills differed greatly. Descriptions that were submitted by respondents ranged from a "quality supervisor responsible for answering complaints and doing customer service" to "multi-tiered quality organizations within the mill." Most mills did have a quality "champion" of some kind, and some had an actual committee to implement improvements in the programs.

A majority of the mills use manual control charts (45%) instead of automated systems (13%); 16% use both (Figure 4). One of the reasons that many mills continue plotting manually is shown in a response from an employee at a specialty paper mill in the South: "There has been some discussion of automated plotting later, but the plotting skills and personal involvement required are thought to be extremely important in the overall SPC culture change."

A second reason for charting manually, according to another southern mill respondent, is "because the degree of automation in our plant does not currently support widespread use of the computers for this purpose." A 1,000-tpd linerboard mill found automated techniques more suitable. "Originally, we wanted manual efforts. We now believe it makes more sense to take advantage of existing distributed control systems and other process control equipment to plot and display data." No specific vendor was mentioned as a major supplier for automated systems. Measurex, Bailey Controls, and Honeywell were named, and many mills said they developed their own software to chart variables.

The following are other statistics concerning mill SPC/SQC programs:

- Seventy-four percent believe all branches and product lines would benefit from an SPC/SQC program. Spe-

Managers comment on quality

Many of the respondents to the *Pulp & Paper* quality survey commented on various aspects of quality control in the industry, including evaluating their own programs. The following selected comments include a brief description of the topic (edited for grammar and style as necessary).

"My 22 years of experience says that there are perceptions and there are realities. I have not yet found a match between perceived quality image and inplant policies and systems. Companies whose presidents speak the loudest are the ones I'm most skeptical of."

—comment on whether there are quality leaders in the paper industry from midwestern paperboard mill

"SPC is applicable to every process. To ask the question, "Which process would benefit the most?" is to assume that there are processes operating at perfection. The question is not, Where should SPC be applied? but, Were should you start? You should start in an area where you think you have a chance to succeed. The first efforts should be selected to yield early fruit. You can then build on success."

—comment on what product lines would most benefit from quality programs from a southeastern market pulp/paperboard mill

"Seminars are usually not effective, except for obtaining the statistical background. The continuous nature of our processes and the large number of variables make implementation difficult. Paper mill examples are needed."

—comment on current quality control seminars and conferences from a West Coast specialty paper mill

"Any product line can benefit from a good quality program. The higher the quality demand, the more the benefit from a practical point of view."

—comment on what product lines would benefit most from quality programs from a northeastern specialty paper mill

The following comments are evaluations of mills' current quality programs. Most mills called their programs successful but said there was room for improvement.

"Some success, but very slow progress. This involves a major culture change. Results to date are better products (we have improved our competitive position), more consistent products, lower costs, a safer mill, and lower water and energy use per ton."

—southeastern containerboard/newsprint mill

"Too early to tell. The verdict is still out."

—midwestern recycled paperboard mill

"We have cut defects, rejects, complaints, and other related quality costs significantly during the past few years, while increasing yield, shippable tonnage, and our overall quality image. The quality program has contributed to our overall corporate success and bottom-line profit significantly. Quality does pay!"

—southeastern specialty paper mill

"At this point, we have been able to develop an overall awareness of the importance of quality in all of our products."

—Canadian market pulp/containerboard mill

"When I look at our SPC program during the last seven years, I am both amazed at how far we have come and appalled by how far we have to go. I judge the program a success because we are still committed to it. SPC is a slow process of continuing improvement."

—southeastern market pulp/paperboard mill

"Our program has succeeded in making quality a priority over production. More can be done, especially as customers ask for evidence of quality performance."

—southern linerboard mill

cific grades included fine paper grades, specialty grades, and market pulp.

- Fifty-eight percent of the mills have all management and operating personnel trained in at least the basics of quality control; 26% have only management or a few key personnel trained; 16% said they have no training at all or no formal training.
- Only 9.6% used outside consultants for program training; 58% said they trained in-house, although many of the key personnel were trained by consultants or through seminars; 19.3% specifically said both in-house methods and consultants were used.
- More than 38% said they have annual or semiannual meetings with customers to discuss product quality; 16% said they met quarterly; 6.6% met monthly; 38.7% said they did not organize any specific meeting times.
- Slightly more than 77% use Pareto diagrams to evaluate problem areas.
- Fifty-five percent use control charts on finished product properties or attributes.
- Sixty-four and a half percent said current seminars and conferences on quality control were meaningful. Some of the seminars included the Univ. of Tenn.'s Institute for Productivity through Quality, Tennessee Associates International, Qualpro, and some seminars offered by TAPPI and CPPA.
- When asked if there were leaders in the area of quality both within and outside of the paper industry, respondents came up with several interesting answers. Those listed included the auto industry, Federal Paper Board, James River Corp., Weyerhaeuser Paper Co., Proctor & Gamble Paper Products Co., Engelhard Corp., and Dow Chemical USA. ■

"It is successful. We have excellent communications between our customers, sales department, management, and quality control groups. We know our customers needs and manufacture accordingly. Personally, I feel SPC would increase production and quality and reduce costs. Down the road we may move in this direction."

—southern fine paper/paperboard mill

"We have established our product as best in our market niche, but we have a lot to do if we are going to maintain this position."

—western market pulp mill

"The program has been successful, but it needs to be expanded."

—northeastern recycled boxboard mill

"It has been successful, but it can be improved. Overall quality is good, and some qualities have earned us a good reputation in the industry."

—southeastern containerboard mill

"Our quality process is successful because after one year it is still here. We have had one success and are struggling with several other teams. Our employees still talk about it and realize it is here to stay. That is the most an organization entrenched in old-style management could hope to accomplish in one year."

—northern paperboard mill

"Program somewhat successful but can be improved. Need more accountability by production."

—southwestern paperboard mill

"We feel our quality control program has been very successful. Customers tell us our products are top of the line. We have received supplier of the year awards from three of our customers."

—southwestern fine paper mill

"Successful but very slow moving. We have distinct improvement in performance within the mill, but too many excursions are due to deficiency of quality awareness. The potential is there but not nearly where it needs to be on communication and teamwork. But we are pressing hard on these key factors. It seems to take forever."

—southern market pulp mill

"We have been successful but believe that implementation of SPC will enhance our competitive effectiveness. Our work force is, in general, quality conscious. We need to provide the tools to reduce and control process variability."

—west coast specialty paper mill

"The quality control program at this mill is well established and well regarded. In the 'classical sense,' it functions well. Our program is, however, not operator-based enough to gain strong ownership by operators. The division's quality improvement process is just getting under way in a formal sense. Its success has yet to be proven."

—midwestern fine paper mill

"Our program has been successful, but it can still be improved. Our product has been applauded for its high quality."

—southern linerboard mill

"We use mostly inspection but need more preventive measures. Use of charts is only part of the program. The biggest need is to have top management set quality control objectives. At our mill, this is not the case. There is too much lip service."

—midwestern specialty paper mill

"Our program, even after two to three years, is still in its infancy. We've accomplished about 30% to 40% of what we need to do to meet our intermediate-range goals."

—northern specialty paper mill

MANAGEMENT

API LOOKS AT INDUSTRY'S ROLE IN EVOLUTION OF SOLID-WASTE ISSUES

Involvement spurred by political pressures fomenting major changes that are expected to affect the paper industry in the long term

By NOEL DeKING, News Editor
and DEBRA GARCIA, Senior News Editor

The subject of solid waste is increasingly affecting businesses other than garbage disposal. It is particularly impacting the paper industry because of its high recovery record and the huge portion of its products that find their way into the waste stream.

Realizing this, the American Paper Institute began to give the issue of solid waste higher priority and last year formed a committee, the Solid Waste Task Force, to take a closer look. At this year's Paper Week, Mar. 13-15, API highlighted solid waste in its Open Industry Forum and then, on Mar. 16, held a day-long seminar on international wastepaper markets.

As noted by R. Eugene Cartledge, chairman of Challenges and Opportunities for Paper, "It [is] hard to envision any municipal solid-waste solution that will not have paper and paperboard in its formulae." Cartledge, who is also president and CEO of Union Camp Corp., has served as the Solid Waste Task Force's first chairman.

Jerry Powell, editor of *Resource Recycling Magazine*, indicated that a "new forest" was being nurtured by the businesses and homes adding their scraps to the recycling effort. He indicated that this would provide the paper industry with a "significant business opportunity," and the industry's response to it would be "one of the more important decisions you make this decade."

API's annual luncheon speaker was noted journalist Pat Buchanan, shown here with Eugene Cartledge (left), chairman of API, and Red Cavaney (right), president of API.

The recyclers' enthusiasm, however, has not been matched by a similar reaction from papermakers, who consider municipalities and other newcomers to the recycling business to be in need of some experience in the realities of the marketplace. The problem for the recycling movement is that it has been based more on a supply-driven objective rather than a market-driven goal, noted William E. Franklin, president of Franklin Associates Ltd. The paper industry supports recycling by expanding markets first, not supplies.

SUPPLY-DRIVEN MARKET WILL NOT WORK. In the past, wastepaper supply has been a function of demand by manufacturers. Now, it is becoming "more a product of government regulation requiring the source separation of recyclable materials," said James B. Malloy, president and CEO of Jefferson Smurfit Corp. "As we move to a supply-driven approach to recycling, materials will be collected for which there is no market. Imbalances in supply and demand could be significant for certain grades, particularly in the near term."

A high percentage of paper is already recycled—29.8% of new supply was recovered for recycling in 1988, of which 20.8% was postconsumer wastepaper, such as old newspapers (ONP), old corrugated containers (OCC), office paper, and mixed paper, he noted. In fact, recovery for recycling has grown so rapidly that in 1988, the total paper going to disposal was flat with 1987, despite the growth in demand for paper products.

The paper industry uses a ratio of wastepaper in its furnish equal to 25% of total paper and board output; this has been increasing in the last three to four years, while woodpulp has been declining. The U.S. collected 25.7 million tons of wastepaper in 1988 and exported 5.6 million tons. The collection and recycling of ONP hit a record high of 4.5 million short tons in 1988, up 31% compared with just five years earlier. This is almost double the rise in newsprint consumption during the same period and represents a recovery rate of 33% of the newsprint used in the U.S.

TASK FORCE CONSIDERS SOLUTIONS. During the past year, API's task force has been "analyzing the municipal solid-waste issue, assessing its impact on the industry, and, if necessary, recommending a revised industry policy on the challenge before us," noted Malloy, a cochairman of the committee. It has drafted a policy on solid waste, which was adopted by API. Addressing the solid-waste solutions of source reduction, recycling, waste-to-energy plants, and landfilling, the task force drafted its own position that "is grounded in the philosophical belief that effective solutions require a balanced, integrated, locally tailored, and economically driven approach to waste management," said Malloy.

Source reduction was considered by the task force to be too costly, particularly considering that it probably would not make much of a difference in the amount of garbage generated. "By comparison, many think we can, over the next several years, recycle as much as 20% to 25% of the waste stream and incinerate even more," noted Malloy.

He also said, "API supports phased-in source separation of waste stream components as a first step in the efficient and effective management of municipal waste. Given time, it will lead to economically efficient determinations about where our waste should go. It will also serve to maximize use of the recyclable portion of the waste stream."

INDUSTRY AT ODDS WITH POLITICIANS. Solid-waste managers and government officials do not see new landfills or waste-to-energy incinerators as the best political solutions to the waste crisis, though. They have placed a higher priority on other means of disposal, such as source reduction and recycling—both of which will affect the paper industry, said Franklin.

In their efforts at source reduction, for example, they are considering taxing such end uses as newspapers and

FIGURE 1: **Gross generation of products in municipal solid waste, 1986.**

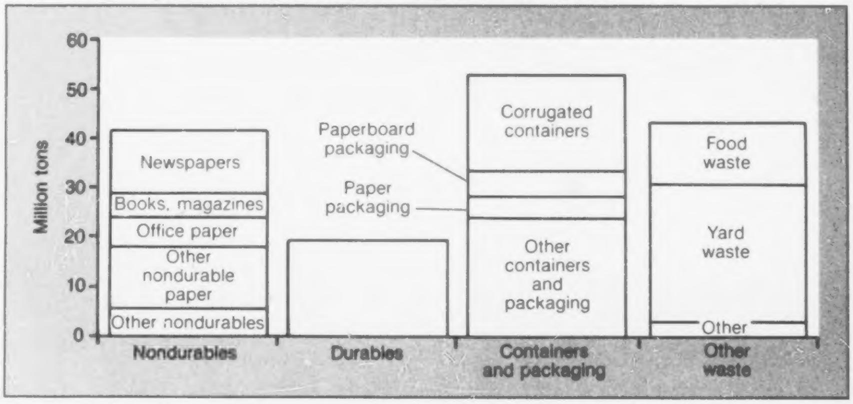
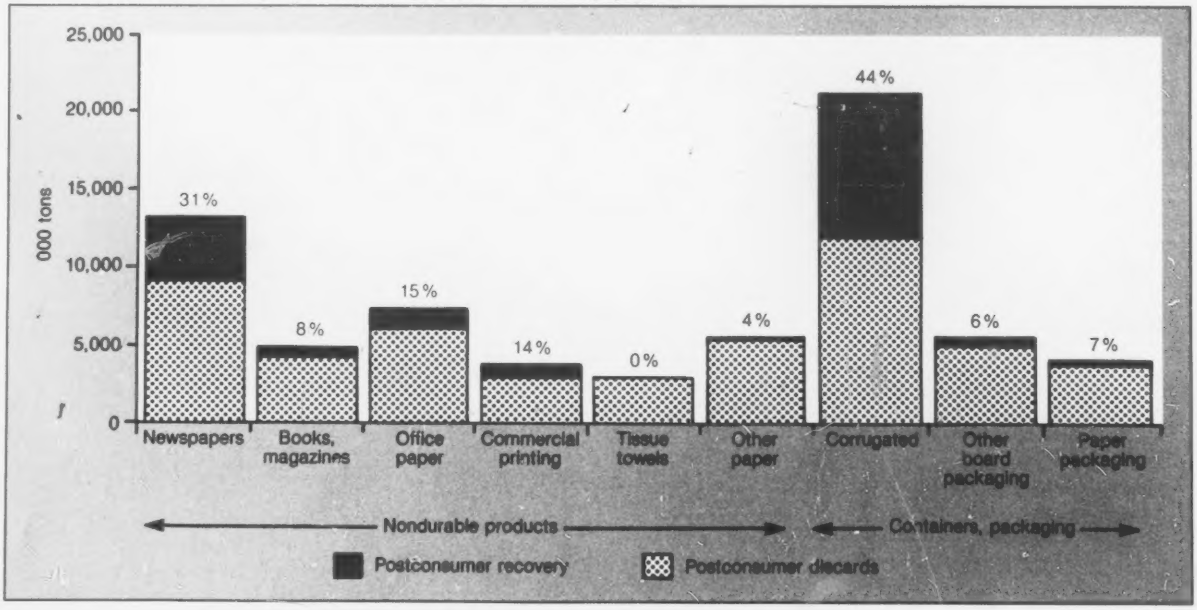


FIGURE 2: **Estimated recovery and discards of postconsumer wastepaper, 1987.**



packaging. Judd Alexander, executive vice president of James River Corp., noted that a 2¢/carton tax in Florida would levy a surcharge of $731/ton on the half-pint milk container. In New York, N.Y., a tax of 3¢ was proposed for every setup package; at that rate, a Kraft Dinner carton would mean a tax of 150%.

"If one or two of these pass, we could see a rapid spread first for packaging and then for disposables, and maybe even reading material," said Alexander. "The industry must play a role in bringing about these solutions . . . or suffer the consequences," he added.

Franklin noted that one new source of hope has been renewed interest in using industrial boilers to burn a densified fuel derived from solid waste. A fiber-based fuel with paper and paperboard appears to be a viable option, he said, indicating that "many paper mills do burn coal and/or hog fuel, both of which are compatible with densified fuel in the form of pellets, cubes, or briquettes."

API TO HELP SITE LANDFILLS. In addition, API has agreed "to work with local governments to identify possible sites on land owned by API companies that may be suitable for new disposal facilities." Of all the options, though, recycling remains the most popular with the general public. The U.S. Environmental Protection Agency and the Bush Administration both have set a goal of 25% source reduction in solid waste by 1992. "Although unrealistic in its time frame," Franklin said, "this is not unrealistic as a goal (eventually)." Currently, the national recycling rate is about 12%, mostly due to recovery of recyclable postconsumer wastepaper grades, said Franklin.

The industry also considers waste-to-energy and paper recycling compatible, provided recyclers are given first access to the recyclable portion of the waste stream. "Our market-based approach to waste management dictates that materials should flow to their most economically efficient end use. In this respect, recyclers should be allowed to compete fairly for the recyclable portion of the waste stream," said Malloy.

The projected increase in wastepaper utilization of 12 million tons would mean that more than half of the projected 22-million-ton increase in production would have to be recycled-fiber based, Franklin noted. "This is most likely to occur, in fact, unless some very dramatic reallocation of capital investment takes place," he said.

How much recycling can the industry do? "It is our view that with a market-driven approach to recycling, we will increase collection rates and utilization of wastepaper significantly over the next decade," said Malloy.

"The point is that recycling can play an important role in waste management, but society cannot recycle its way out of the solid-waste dilemma. Irrespective of the success of source reduction and recycling initiative, there will still be approximately 150 million tpy of garbage to burn or to bury," he said.

Exports may not be the answer to the garbage problem, either. Noted Franklin, "Exports are a two-edged sword in terms of municipal solid waste. A high percentage of paper exported comes back to the U.S. as packaging that is largely unrecyclable; whereas, the fiber recovered and recycled in the U.S. does not exhibit this problem."

WORLDWIDE USE RISING. Speakers at API's first international wastepaper recycling symposium were generally optimistic about secondary fiber demand trends in North America, Latin America, the Far East, and Western Europe. Consumption is growing in these regions of the world because of high operating rates at existing recycled operations, new mills coming onstream, and board and paper production records being set each year.

"This upward movement will likely continue during

TABLE 1: **Wastepaper use in 20 countries, 1987-88.**

	Wastepaper recovered (000 tons)	Wastepaper consumed (000/tons)	Recovery rate (%)	Utilization rate (%)
U.S.	26,000	20,100	31	24
Canada	1,400	830	23	5
Mexico	1,250	2,070	47	65
Brazil	1,570	1,600	34	31
Venezuela	320	400	35	50
Colombia	225	245	42	50
U.K.	2,700	2,300	30	56
France	2,550	2,460	35	42
Denmark	345	250	29	69
Fed. Rep. Germany	4,735	4,310	41	43
Netherlands	1,410	1,480	55	68
Belgium	610	260	35	24
Italy	1,600	2,360	26	44
Spain	1,660	2,220	41	58
Portugal	305	325	44	44
Japan	12,000	12,590	48	49
People's Rep. China	2,600	2,900	20	25
Rep. Korea	1,420	2,630	43	68
Taiwan	1,140	2,385	40	87
Australia	690	605	30	36

Note: All figures are metric tons except U.S.

Sources: American Paper Institute; Canadian Pulp & Paper Assn.; European Confederation of Pulp, Paper & Board Industries; Food & Agricultural Organization of the United Nations; *Pulp & Paper International.*

all of 1989 as it did last year," stated J. Rodney Edwards, API's vice president-paperboard group. "Most Asian nations have maximized their domestic collections and, therefore, depend on imported wastepaper to take care of their growth in demand." The U.S. also has seen dramatic increases in exports to developing countries that are without pulp-producing capabilities and still dependent on small, older mills that rely exclusively on wastepaper and other secondary fibers.

Henrik Kroner, representing the European Community's paper industry confederation, CEPAC, welcomed the rise in wastepaper utilization and recovery in Europe. In 1988, some 16.5 million metric tons of wastepaper were used in Europe, representing about 48% of the paper industry's total fiber supply. Europe's needs still exceed collection volume, so imports are still required, particularly in Spain and Italy.

Gerry West of Severnside Waste Paper Ltd. noted that a record 2.7 million tons of wastepaper were collected in the U.K. in 1988, and some 400,000 tons were exported, mostly to mainland Europe. Due to the high price of market pulp, the demand for high-grade pulp substitutes exceeded supply, but ONP was in oversupply.

Spain and Portugal are also enjoying above-average economic growth, which is boosting demand for all paper grades, said Jose-Antonio Buenaposada of Carto-Espana SA. In 1988, Spain imported 560,000 tons of wastepaper, with about 32% coming from the U.S. Like Italy, Spain's use of wastepaper is increasing faster than its collection rate.

FAR EAST STILL MAJOR CONSUMER. The Far East continues to be the biggest buyer of U.S. wastepaper exports, even though domestic collection systems are sophisticated. In Japan, some 70% of OCC and 94% of ONP was recovered from the total of 12 million tons of wastepaper collected in 1988. But this still did not meet demand, said Hiromi Umehara of Kasho (USA). Consumption of wastepaper in Japan represents slightly more than 50% of total papermaking furnish. Net imports dropped to 590,000 tons in 1988, but Japanese brokers increased exports to offset low domestic prices. The U.S. supplied upwards of 90% of this total.

Rep. Korea and Taiwan imported well over 1 million tons of wastepaper from the U.S. in 1988. Rep. Korea depends on wastepaper to supply 68% of its papermaking fiber, and domestic collection falls significantly short of this level, said D.K. Cho of Chonju Paper Manufacturing Co. Rep. Korea will need an additional 160,000 tpy of wastepaper to support planned expansions in the country's paper and board sector. Most of the additional volume is expected to come from the U.S.

German Esquerra of Smurfit Latin America reported that in 1988, Mexico imported 820,000 tons of wastepaper and 550,000 tons of pulp. OCC imported from the U.S. is of such high quality that it is actually considered a pulp substitute, he noted. Mexico will likely increase its imports of wastepaper to meet demand, rather than raise collection rates. The close proximity of the huge U.S. market also means that most of these imports will come from the U.S. This will likely be the trend in other Latin American countries as well.

Canada's abundance of forest resources diminishes its dependence on wastepaper fibers, reported Gordon Minnes of the Canadian Pulp & Paper Assn. Nevertheless, 40 of Canada's 145 mills use some wastepaper in their stock. In 1988, Canada used 1.8 million tons of wastepaper for 11% of its papermaking furnish. Some 50% of this volume is OCC used to manufacture paperboard packaging. Canada imported 584,000 tons of wastepaper from the U.S. in 1988 to supplement its domestic collection. Some incremental increase in wastepaper use is expected in the future, but gains will be modest, said Minnes.

U.S. NUMBER ONE EXPORTER. Edwards noted that the U.S. is the leading exporter of wastepaper; the top five importers are Rep. Korea, Taiwan, Mexico, Japan, and Canada. In the U.S., about 200 mills use wastepaper exclusively, and another 100 mills use between 10% and 50% wastepaper in their furnish. Old corrugated is the largest category of wastepaper used, at about 9.7 million tons, followed by ONP, 3.2 million tons; pulp substitutes, 2.9 million tons; mixed paper, 2.2 million tons; and high-grade deinking, 1.7 million tons. The highest wastepaper utilization is in recycled paperboard, tissue grades, newsprint, and semichemical corrugating medium.

Five U.S. states currently have mandatory recycling laws, and more states and cities are expected to follow with their own recycling schemes in the next few years. This will dramatically increase wastepaper supply, and any oversupply will probably be exported, said Edwards. The domestic industry is forecast to boost wastepaper consumption to 26% of its fiber supply by 1990—not enough to offset the expected increase in new supply. ■

API guidelines for recycling

1. Phase in source separation programs to minimize dislocations in supply and demand.

2. Focus on specific grades of paper for which there is likely to be a market.

3. Emphasize wastepaper quality. Communities must realize the importance of generating clean, grade-separated paper.

4. Market recyclable materials based on the avoided cost of disposal. This will provide sufficient and efficient incentive to maximize paper recycling over time.

5. Rely on private collection and distribution systems to the maximum extent possible. It provides a solid foundation upon which we must expand our efforts.

PULP & PAPER

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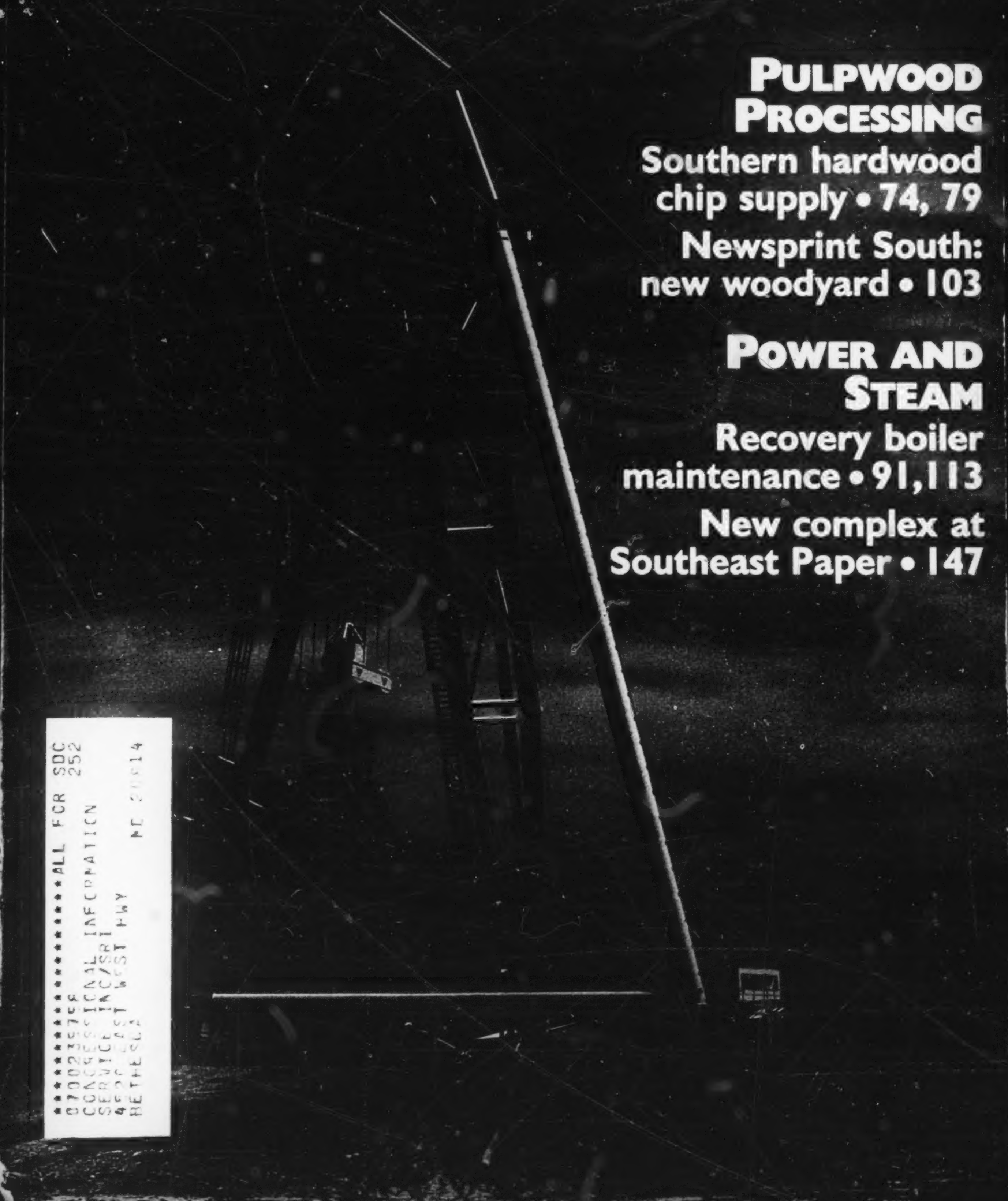
July 1989



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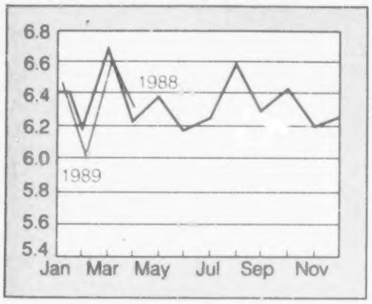
ABP

BPA

U.S. paper and board production



U.S. production of paper and paperboard totaled 6.3 million tons in April, down 0.3% from the same month last year, according to the American Paper Institute. The seasonally adjusted annual rate through the first four months was 77.1 million tpy, the same rate as in early 1988 and 0.7% above total 1988 production. Paperboard production through April was up 0.4% on a seasonally adjusted basis, while paper was down 0.3%.

Among major grades, uncoated groundwood production jumped 9.4% on the strength of higher shipments to commercial printers, API reported. Uncoated free-sheet was flat and coated paper was down 5.0%, however, so overall printing and writing paper production was off 1.0% through April. Containerboard production for the domestic market climbed 0.2%, but production of boxboard for domestic use dropped 3.3%. Export markets for linerboard remained strong despite the rising dollar, with overseas shipments through the first quarter up 8.1%.

Canadian newsprint shipments totaled 785,000 metric tons in April, 0.5% less than a year earlier. Operating rates dropped sharply to 94%, as more mills took downtime. Pulp shipments dipped 1.3% for the month, with mills operating at 90%. ■

		Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
***PAPER & PAPERBOARD PRODUCTION*[1]**					
Newsprint	Apr.	495	-0.4	5,890	-1.1
Uncoated groundwood (s)	Apr.	145	14.2	1,715	9.4
Coated paper (s)	Apr.	574	-5.7	7,093	-5.0
Uncoated free-sheet (s)	Apr.	954	0.7	11,444	0.2
Other printing/writing	Apr.	128	-4.5	1,525	-1.2
Total packaging and other paper (s)	Apr.	386	-11.9	5,091	4.6
Tissue	Apr.	465	4.5	5,617	3.4
Total paper	**Apr.**	**3,147**	**-1.6**	**38,375**	**-0.9**
Unbleached kraft paperboard	Apr.	1,587	3.2	19,252	-0.2
Semichemical medium	Apr.	468	4.7	5,731	2.8
Bleached paperboard	Apr.	356	-5.6	4,406	-3.1
Recycled paperboard	Apr.	739	-2.0	8,768	-2.3
Total paperboard	**Apr.**	**3,148**	**1.0**	**38,155**	**-0.4**
Total U.S. paper and paperboard output	**Apr.**	**6,295**	**-0.3**	**76,530**	**-0.6**
***PULP, WASTEPAPER & FIBER*[2]**					
Total U.S. woodpulp production	Mar.	5,306	1.6	62,374	1.1
Market pulp production	Mar.	770	5.8	8,935	3.7
Wastepaper consumption at paper/board mills	Mar.	1,613	-2.8	18,792	-1.0
Pulpwood consumption (cords)	Mar.	8,169	-1.0	97,456	0.6
***CONVERTED PRODUCTS STATISTICS*[3]**					
Corrugated box shipments (billion ft²)	Apr.	26.367	0.9	103.850[6]	0.6
Containerboard inventories at U.S. box plants and mills	Apr. 1	2,568	2.2		
***INTERNATIONAL TRADE*[2]**					
U.S. paper imports (including products)	Mar.	1,128	-3.8	12,767	-0.8
Imports of Canadian newsprint	Mar.	707	-9.9	7,850[6]	-9.5
U.S. paper exports (including products)	Mar.	606	12.8	6,273	13.3
Exports of unbleached kraft linerboard	Mar.	231	4.1	2,346	8.1
Exports of woodpulp	Mar.	623	26.9	6,347	19.7
Norscan pulp inventories[4]	Apr. 30	804	-2.1		
Norscan pulp operating rates[4]	Apr.	96%	97%	98%	99%
CANADIAN STATISTICS*[5] *(reported in metric tons)					
Total newsprint shipments	Apr.	785	-0.5	3,092[6]	-2.4
Operating rates	Apr.	94%	99%	96%	100%
Inventories held by U.S. consumers	Apr. 30	1,334	-12.2		
Other paper/board shipments	Apr.	543	-4.7	2,193	-1.3
Woodpulp shipments (export only)	Apr.	620	-1.3	2,636	0.2
Operating rates	Apr.	90%	93%	94%	96%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

Bleached paperboard: Most producers are sold out as prices climb to record levels

Grade structure: Solid bleached sulfate (SBS) is used primarily for folding carton and milk carton packaging and is produced from a furnish containing not less than 80% virgin bleached woodpulp. Other uses include cup and plate stock, nested food containers, and linerboard. Calipers range from 10 to 28 pt. in low, medium, and high density, and basis weights vary from 120 to 300 lb/3,000 ft². Most SBS produced is either clay- or polyethylene-coated.

Markets: Market demand for bleached paperboard grades, as measured by their 1989 capacity share, is folding boxboard, 48.8%; milk carton and food service, 43.9%; linerboard, 3.5%; and other packaging, 3.8%.

Production/capacity: Production in 1988 increased 1.4% to 4.483 million tons, which was a record production level despite widespread maintenance shutdowns early in the year. Operating rates improved to 95.1%, slightly higher than the 94.5% level in 1987. Exports accounted for 628,000 tons, or about 14% of production.

Among the major end uses, production of folding carton stock increased just 1.2%, milk carton stock decreased 2.6%, food service products increased 3.1%, and other packaging uses increased 15.7%.

Capacity increases have averaged only 1.1% annually during the past ten years, so the bleached board industry is capacity constrained at present. Producers have dedicated all available capacity to bleached board production and have stopped producing bleached pulp on their paper machines, according to industry reports. Still, demand exceeds supply. Some long-term relief is in sight by 1992, when Federal Paper Board Co. and Westvaco Corp. plan to start up new machines, which will add over 500,000 annual tons of capacity.

In the short term, International Paper Co., Potlatch Corp., Georgia-Pacific Corp., Temple-Eastex Corp., and Federal ~~will upg~~rade existing machines to add about 300,000 annual tons of capacity by 1991. In Canada, Tembec Inc. will start up a new 154,000-tpy multi-ply bleached paperboard machine at the end of this year, and as much as half of this machine's output will be sold in the U.S. U.S. industry capacity should reach 5 million tons in 1991.

Outlook: Bleached paperboard consumption is expected to increase this year to 4.511 million tons, and operating rates will exceed 95%. Supply has been tight in the first half of the year, and shortages will continue through the end of the year because demand for SBS packaging exceeds supply.

Folding carton demand will remain strong through the end of the year. Demand for paperboard liquid packaging will continue growing in domestic and export markets as the consumption of fresh milk and juice increases worldwide. The small decline in milk carton production last year resulted from several producers taking shutdowns, rather than a drop in demand. The increasing use of milk cartons in packaging nonfood items will also fuel demand for these grades.

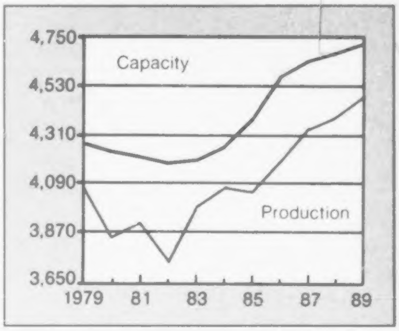
The demand for disposable bleached paperboard food service products should remain firm this year. Environmental concerns about plastic disposable packaging have helped disposable paper products, such as cups, plates, trays, and food containers.

Prices: Producers raised prices by $50/ton for clay-coated folding boxboard grades on Jan. 1, increasing the price of 15-pt board to between $780 and $790/ton. Prices of polyethylene-coated milk carton stock and other specialty packaging grades rose at the beginning of the year to levels of $925 to $1,025/ton. Prices of bleached printing bristols also increased about $50/ton to approximately $980/ton for 10-pt bristol grades and $1,040/ton for 7-pt grades.

Several major SBS producers have announced another $50/ton price hike for either July or August. It is likely that producers will successfully implement this price increase because demand is strong and prices are firm.

Historical prices for fully bleached, clay-coated 15-pt folding carton boxboard (rolls, $/short ton, year-end prices): 1980, $550; 1981, $625; 1982, $590/625; 1983, $590/625; 1984, $590/665; 1985, $500/590; 1986, $580/590; 1987, $635; 1988, $730.

SUPPLY/DEMAND *(000 tons)*



FORECAST *(000 tons)*

	1987	1988	1989e
Production	4,420	4,483	4.511
Capacity	4,679	4,715	4,735
Utilization rate	94.5	95.1	95.3
Imports	7	8	20
Exports	619	628	645
Apparent U.S. consumption	3,808	3,863	3,886
lb/capita	31.3	31.5	31.6
GNP ratio[1]	1.00	1.01	1.00

e = Estimate

1. 000 tons/billion $ real GNP

TOP U.S. PRODUCERS *(000 tpy)*

	Annual capacity	Market share (%)
1. International Paper	935	19.7
2. Federal Paper	631	13.3
3. Westvaco	600	12.7
4. Potlatch	554	11.7
5. Georgia-Pacific[1]	360	7.6
6. Temple-Eastex	357	7.5
7. Champion	247	5.2
8. James River	235	4.9
9. Gulf States	230	4.8
10. Weyerhaeuser	210	4.4

Market share of top five companies:
65.0%

Market share of top ten companies:
91.8%

Total U.S. capacity (1989):
4.735 million short tons

1. Acquired Brunswick Pulp & Paper Co. in 1988.

LINERBOARD

U.S. liner producers begin admitting defeat

U.S. linerboard producers have begun to admit defeat in their six-month struggle to raise prices by $30/ton to the $440 level. Great Northern Nekoosa Corp.'s price for June will be $410 "because that's where the market says the price is," said a company spokesman.

A Union Camp Corp. executive recently told analysts that the increase was dead, but the company might try again in the fall if market conditions are strong enough. The first company to roll back the increase was said to be Weyerhaeuser Paper Co., which in late May told customers that its June price would be $410 in both the East and West.

Companies such as Stone Container Corp. and International Paper Co., however, say they are still at the $440 list price, although IP admits to meeting "competitive situations." A marketing manager with Gaylord Container Corp. said that the company's price is still $440 in both the East and West. Most companies have issued rebates to customers who did pay the price increase in April and May, and as one observer commented, "For all practical purposes, the price increase is dead."

Companies maintaining the $440 list price appear to be trying to help support customers who in some cases were able to raise box prices. Some hope exists that the industry may still be able to get the $440 price in the West, where wood costs this year are expected to soar by more than 50%. Nevertheless, it is uncertain whether or not a $30/ton differential on the West can be sustained since mills further east would be tempted to ship board into the region if freight rates were favorable.

Industry operating conditions remain strong, with unbleached kraft board mills running at 99% in April and averaging close to 96% in the first quarter of 1989. Inventories of containerboard at box plants have generally remained stable and on May 1 stood at 2.42 million tons, equal to 4.8 weeks of supply. Box shipments runningthrough April have been 0.6% ahead of last year (or 1.8% adjusted for one less working day this year).

Why did the increase fail? As Jerry H. Ballengee, executive vice president of Union Camp, told analysts recently, "All the fundamentals were there: high operating rates, lower linerboard inventory levels, and strong box demand." Reasons for the failure were cited by industry observers to *Pulp & Paper Week*:

- Strong resistance to the box price increase from end users who have seen their prices for corrugated boxes rise sharply over the last three years. Lack of movement in box prices has caused resistance to the linerboard increase from independent converters. (The increase to $440 would have meant that prices had jumped 76% from their $250 level in early 1986; if calculated from the last peak of $350/ton in 1984, the rate of increase averages out to about 4%/ year.)
- Box shipments are up nationally, but most of the strength up to April has been in the southeast (+5.1%) and south central (+0.6%) regions. The northeast (-1.1%) and east central (-1.6%) areas, both of which have the largest concentration of independent converters, showed declines.
- A high rate of underlying industry capacity growth due mainly to a large number of incremental expansion projects. U.S. linerboard capacity is expected to grow about 3% this year and will accelerate to more than 4%/year in 1990-91. With supply outpacing demand, operating rates have begun to decline.
- The strengthening of the dollar this year, which could begin to have an impact on U.S. linerboard exports. A much higher dollar and its impact on exports was the major cause of the price collapse in 1985. Through the first quarter, however, exports have held up reasonably well, up 13% to 664,000 tons, according to U.S. Dept. of Commerce statistics.

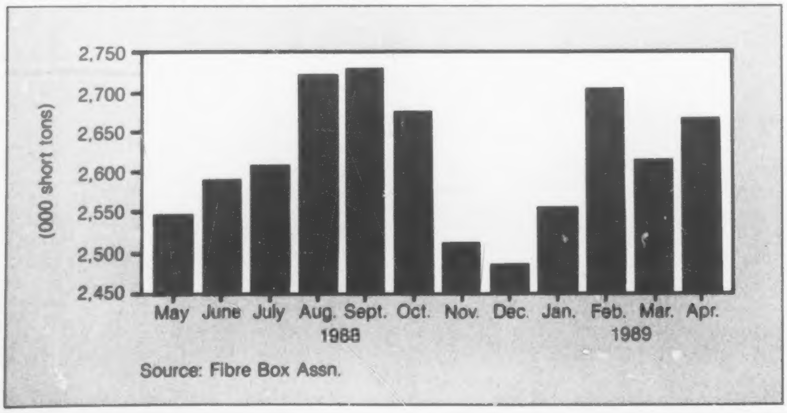
The surge in the dollar and collapse of the domestic price increase have probably killed chances for an export linerboard price increase in Europe. Existing U.S. linerboard price levels in Europe may come under more pressure unless Nordic producers raise European currency prices July 1. Meanwhile, the recent unrest in People's Rep. China could reduce second-half U.S. shipments to Asia. ■

Region	Shipments (billions ft²)	% change from first four months of 1988
Northeast	18.271	-1.1
Southeast	20.349	5.1
East central	14.944	-1.6
North central	12.709	0.2
South central	20.641	0.6
West	16.936	-0.7
Total U.S.	103.850	0.6

*Not adjusted for one less day this year.
Source: Fibre Box Assn.

U.S. corrugated box shipments through April 1989.

Containerboard inventories at U.S. box plants and mills.



Source: Fibre Box Assn.

PRINTING/WRITING PAPER

Boise studying coated machine; delays costly

Boise Cascade Corp. is studying the future addition of a new "world-scale" coated groundwood paper machine as part of the modernization of its Rumford, Maine, mill, according to Steve Larson, vice president-coated paper division. The machine would probably be in excess of 320 in., make No. 4 groundwood, and cost more than $400 million. It most likely would not be installed before the end of 1991.

The company already is spending $64 million for the rebuild of Nos. R-10 and 15 coated machines. Upgrading will add about 20,000 tpy of Nos. 4 and 5 coated groundwood on No. R-15 and 26,000 tpy of Nos. 3 and 4 coated free-sheet on No. 10. A new headbox is due to be installed on R-15 this summer.

Rumford is also getting a $194-million cogeneration project to stabilize energy costs through use of bark and coal rather than 636,000 barrels a year of purchased fuel oil. Expansion is also under way at the pulp mill. Boise will add 76,000 tpy of kraft pulp for $74 million. The mill sells 40,000 to 60,000 tpy of market pulp. This pulp would support the new machine.

Boise said the new machine, if installed, probably would produce No. 4 coated groundwood because the type of pulps produced there lend themselves to that grade.

Labor problems are costly. Meanwhile, labor-related construction delays on the new uncoated free-sheet machine at International Falls, Minn., are costing the company about $2.5 million a week since construction stopped May 1, said Bob Anderson, public affairs manager.

Building construction for the new alkaline project at International Falls has been delayed due to management labor disputes. Meetings are being conducted to work out problems that the company said could scuttle the $535-million project.

The company will rescind imposed labor agreements for five construction unions. Benefits for those unions will be restored to the 1984 level, Anderson said. However, the National Labor Relations Board said management and labor had reached "a proper impasse" for contracts with the three production unions. ■

Major North American new coated paper expansions.

Company	Location	Capacity (000 tpy)	Startup date
Blandin Paper Co.	Grand Rapids, Minn.	220 CGW	1989
Champion Papers	Bucksport, Maine	33 CGW	1989
Consolidated Papers Inc.	Stevens Pt., Wis.	60 CGW*	1989
International Paper Co.	Corinth, N.Y.	100 CF	1989
Champion Papers	Sartell, Minn.	—CGW	1989
Repap Enterprises Inc.	Newcastle, N.B.	200-260 CGW/CF	1989
Fraser Paper Ltd.	Madawaska, Maine	—CGW	1990
Westvaco Corp.	Wickliffe, Ky.	100 CF	1990
Champion Papers	Quinnesec, Mich.	265 CF*	1990
Scott Paper Co.	Skowhegan, Maine	215 CF*	1990
Scott Paper Co.	Muskegon, Mich.	30 CF	1990
Proposed			
Blandin Paper Co.	Grand Rapids, Minn.	250 CGW	n.a.
Boise Cascade Corp.	Rumford, Maine	—CGW*	1991
Bowater Southern	Calhoun, Tenn.	250 CGW*	n.a.
Fraser Paper Ltd.	Madawaska, Maine	—CGW*	n.a.
GNN/MD Papier	Millinocket, Maine	—CGW*	n.a.
James River Corp.	St. Francisville, La.	—CGW*	n.a.
Mead Corp.	Escanaba, Mich.	—CGW*	n.a.
Pentair Inc.	Niagara, Wis.	92 CGW	n.a.
International Paper Co.	n.a.	—CF	n.a.
Repap Enterprises Inc.	The Pas, Man.	—CF	n.a.

*New machines
CGW—coated groundwood; CF—coated free-sheet.

Source: *Pulp & Paper Week.*

James River, Bowater study groundwood machines

Both James River Corp. and Bowater Inc. are studying the addition of new coated groundwood paper machines, the companies reported. James River may add a new machine at its coated publication paper mill in St. Francisville, La. Bowater is also looking at a new machine for its Calhoun, Tenn., mill.

James River's St. Francisville mill produces about 230,000 tpy of coated groundwood paper used primarily in magazines, catalogs, and direct mail. Rust International, Portland, Ore., is the consulting engineer for the James River study. The current building at St. Francisville would be extended to accommodate the new machine.

Calhoun currently produces about 790,000 metric tpy of newsprint and is building a 900-tpd bleached kraft pulp mill to replace the 700-tpd semi-bleached kraft mill. Bowater's Catawba, S.C., mill manufactures about 340,000 tpy of coated mechanical grades. The study was announced by Anthony P. Gammie, chairman and CEO.

Gammie also said that a replacement bleached kraft pulp mill at Calhoun and a new thermomechanical pulp mill in Nova Scotia are scheduled to be online before the year's end. Bowater is studying the costs involved in recycling newspapers for new newsprint production. Gammie said Bowater hopes to announce plans for a newsprint recycling facility this year.

More coated machines. Bowater and James River are not alone in considering new coated groundwood capacity. Also under study is a joint venture between Great Northern Nekoosa Corp. and MD Papier of Fed. Rep. Germany near the Millinocket, Maine, groundwood specialties mill (see following story). Fraser Paper Co. also has coated groundwood paper machines under study.

Although no announcement has been made, Consolidated Papers Inc. is also reported to have at least one new machine in the early study stage. Repap Enterprises Inc. recently indicated plans to install as many as five paper machines over the next decade at its newly acquired Manitoba mill and is considering the possibility of other sites.

- James River Corp. plans to spend

TISSUE

Fort Howard puts cup business up for sale

Fort Howard Corp. is seeking a buyer for its cup operations, which had sales that amounted to $925 million last year. However, the sale does not involve the company's tissue operations, which include mills located in Wisconsin, Oklahoma, Georgia, and the U.K.

Fort Howard Cup Corp. is presently the largest producer of disposable paper and plastic food-service products in North America. It commands an estimated 28% of the U.S. market in comparison to James River Corp.'s 18% stake.

Fort Howard's cup business consists of 15 plants in North America and facilities in Hong Kong, the U.K., and the Netherlands. It provides employment for approximately 9,400 people worldwide, 8,300 of whom are employed in the U.S. In 1987, the company's disposable food service products (including napkins) accounted for 63% of the $1.75 billion in sales.

Fort Howard said it will use the proceeds of the sale to "free up cash for debt reduction and capital investment in its tissue business." Analysts have been wondering how long Fort Howard would hold on to its cup operations, which were responsible for the company's lower earnings in early 1987, in the face of the large debt the company incurred during its leveraged buyout that took place last summer. ■

Mosinee to buy P&G's Cheboygan tissue mill

Mosinee Paper Corp. announced that it has agreed to buy Procter & Gamble Co.'s two-machine tissue mill in Cheboygan, Mich., for an undisclosed amount.

The mill is small and reportedly has capacity of under 100 tpd, although Mosinee said it will make "significant capital expenditures" to convert the plant and equipment to be ready for its future needs. The purchase will enable Mosinee to fully integrate its Bay West towel and tissue converting operation in Green Bay, Wis.

Mosinee said it plans to install deinking facilities at the Cheboygan mill. A spokesman for Mosinee said that the company is also planning to move its converting lines from its Bay West subsidiary in Green Bay, Wis., to Cheboygan.

The project hinges on many things, including getting land for a wastewater treatment plant, permits from the state of Michigan, a contract with the United Paperworkers International Union, and a tax abatement under Michigan's Industrial Rehabilitation Act. The initial capacity of the two-machine mill will be 60,000 tpy. The spokesman said the company plans to rebuild the tissue machines and may expand its product line. ■

Wisconsin Tissue breaks ground for tissue machine

Wisconsin Tissue Mills, a subsidiary of Chesapeake Corp., has broken ground for its new 80,000-tpy tissue machine at its mill in Menasha, Wis. WTM president Charles Cianciola said the 100%-recycled-tissue machine will start up in July or August of 1990. He said the mill has received sufficient approval from regulatory authorities to break ground. WTM plans to use mainly coated book stock for furnish. The converting operations of the mill are already functioning, including an automatic storage and retrieval system that was supplied by Eaton Kenway. The system started up about a month ago.

• **Chesapeake Corp.** said it has formed Chesapeake Consumer Products Co., a new wholly owned subsidiary. Separately, Chesapeake said it has acquired the assets of Finess USA Inc., a wholly owned subsidiary of Swedish Match Holdings Inc. The terms were not disclosed. Finess markets tabletop tissue products. The company reports that the new unit will combine the businesses of Finess USA and Wisconsin Tissue's consumer products division and focus on tabletop tissue as well as specialty paper products. ■

ENVIRONMENT

British Columbian mills will install secondary treatment

British Columbia's Environment Minister Bruce Strachan has announced that the 17 pulp mills in the province that use the chlorine bleaching process will be required to spend a combined C$800 million by 1994 to eliminate the production of toxic chemicals. He said the mills will have to install secondary wastewater treatment plants by Dec. 31, 1991. Currently, the coastal mills discharge effluent directly into the Pacific Ocean.

The $800 million works out to about $47 million per mill. This is in addition to the $10 million that the Pulp & Paper Research Institute of Canada estimated it would cost a mill to install additional chlorine-dioxide generating equipment.

Strachan also said that the pulp mills must limit their discharges of chlorinated organic compounds, including dioxins and furans, to 1.5 kg/metric ton of pulp by 1994. This is the same level that mills in Sweden will have to meet by 1990. British Columbia is apparently not going to require the mills to install oxygen delignification systems, which the province of Alberta is requiring.

Since the announcement, Fletcher Challenge Canada Ltd., Howe Sound Pulp & Paper Ltd., Western Pulp Ltd. Partnership, Canadian Pacific Forest Products Ltd., and Canfor Inc. have all slated multimillion spending programs to enable their pulp mills in the province to meet the new government regulations. ■

CAPACITY

Canadian capacity increases greatest in printing, CTMP

Capacity increases over the next three years will be most significant in the coated groundwood, uncoated free-sheet, and market mechanical pulp sectors of the industry, according to the Canadian Pulp & Paper Assn.'s annual capacity survey.

Total paper and board capacity in Canada reached 17.7 million metric tons in 1988 and is expected to grow by 5.9% annually during 1988-91, reaching 21.0 million tons. At the same time, pulp capacity of 25.0 million tons in 1988 will rise 4.3% annually to 28.4 million tons. Of this, market pulp capacity of 8.4 million tons will increase at the annual rate of 4.0% to 9.5 million tons.

Surge in printing/writing. Printing/writing capacity in Canada will be boosted by 41.3% to 4.26 million tons in 1991. The biggest jump here will occur in coated groundwood grades, rising by 60.9% to 555,000 tons, primarily due to the startup of one machine at Repap Enterprises Inc.'s Newcastle, N.B., mill.

Uncoated free-sheet capacity will increase by 47.6% to 1.54 million tons due to four machine startups. Domtar Inc. brought a second new machine onstream this past spring at the Windsor, Que., mill, where the first new machine came online in 1987. Also in the second quarter, Canadian Pacific Forest Products Ltd. started up its new paper machine at Dryden, Ont.

A new 1989 coating facility at Island Paper Mills Co.'s New Westminster, B.C., mill is responsible for much of Canada's projected 38.5% jump in coated free-sheet capacity to 180,000 tons by 1991. Uncoated groundwood capacity is expected to grow by 32.6% to 1.982 million tons at that time due to a new supercalendered paper machine at St. Marys Paper Inc.'s Sault Ste. Marie, Ont., mill, plus conversions from newsprint and kraft paper at other mills, CPPA said.

Three new machines will raise sanitary paper capacity by 23.3% to 613,000 tons in 1991.

Eight new newsprint machines. Newsprint capacity will expand substantially with the addition of eight new newsprint machines, according to CPPA (this also includes Consolidated Bathurst Inc.'s new machine at Grand'Mère, Que., which is not expected to make any commodity-type newsprint). Including the machine at Grand'Mère, CPPA projects a 14.7% jump in newsprint capacity to 11.57 million tons in 1991.

Capacity to produce containerboard will grow by 11.6% to 2.28 million tons by 1991. This is primarily due to the new corrugating medium machine at Consolidated Bathurst's Bathurst, N.B., mill late last year, plus an increase in kraft linerboard capacity at Eurocan Pulp & Paper Co.'s Kitimat, B.C., mill this year.

A healthy 27.0% jump in capacity is expected in the boxboard sector. Much of the growth in the recycled grades is attributed to Cascades' expansion at Jonquière, Que. Tembec Inc.'s new machine slated to start up late this year at Temiscaming, Que., contributed much of the projected 241.4%, or 140,000-ton, jump in solid bleached paperboard capacity.

Kraft paper capacity is expected to decline by 3.8% to 539,000 tons in 1991 due to machine conversions to printing paper. Building board capacity will increase by 7.7% to 760,000 tons during this time.

CTMP leads pulp expansion. Mechanical pulp capacity growth will represent two-thirds of the increase in total Canadian pulping capacity during 1988-91, according to CPPA's survey. Four new market chemi-thermomechanical pulp (CTMP) lines that came onstream in 1988 are included as well as the projected 1990-91 startup of Donohue-Matane Inc.'s greenfield CTMP mill in Matane, Que. Stone groundwood pulp capacity is projected to decline 10.8% to 4.83 million tons by 1991.

Sulfite capacity will drop by 5.9% to 1.74 million tons, while dissolving/special alpha capacity will plummet by 9.0% to 252,000 tons.

Sulfate capacity is projected to rise, however, by 9.6% to 12.63 million tons in 1991. Much of this is due to a 36.1% increase in capacity to produce bleached hardwood sulfate and involves tonnages associated with fine paper expansions in Ontario and Saskatchewan, increased production at James Maclaren Industries Inc.'s Thurso, Que., mill, and the startup of Peace River Pulp Co.'s Peace River, Alta., mill. Bleached softwood sulfate capacity will increase 7.1% to 7.94 million tons in 1991.

Most kraft growth in hardwood. Growth in market pulp capacity will be most significant in mechanical grades, where the increase is projected to be 74.2% over the three-year survey period, to 1.298 million tons in 1991. Much of the 553,000-ton growth in market mechanical pulp capacity during 1988-91 is attributed to four new CTMP lines in 1988 and the startup of the Matane, Que., CTMP mill in 1990-91. ■

Canadian industry annual capacity growth, 1988-91 (000 metric tons).

Market pulp	**1988**	**1989**	**1990**	**1991**
Sulfite paper grades	323	341	340	340
Sulfate paper grades				
Total	7,067	7,088	7,252	7,570
Bleached softwood	5,665	5,664	5,716	5,784
Semibleached softwood	376	374	392	425
Bleached hardwood	913	935	1,034	1,251
Unbleached	113	115	110	110
Total chemical paper grades	7,390	7,429	7,592	7,910
Dissolving/special alpha	277	273	252	252
Mechanical	745	1,110	1,147	1,298
Total market pulp	**8,412**	**8,812**	**8,991**	**9,460**
Increase from previous year	**233** **(2.8%)**	**400** **(4.8%)**	**179** **(2.0%)**	**469** **(5.2%)**
Paper and board				
Newsprint	10,085	10,350	11,035	11,565
Uncoated groundwood	1,495	1,709	1,839	1,982
Coated groundwood	345	390	520	555
Uncoated free-sheet	1,046	1,322	1,517	1,544
Coated free-sheet	130	145	165	180
Kraft paper	560	531	523	539
Sanitary paper	561	592	656	682
Containerboard	2,039	2,099	2,253	2,275
Boxboard	767	798	912	974
Building and other	706	748	758	760
Total paper and board	**17,734**	**18,684**	**20,178**	**21,056**
Increase from previous year	**549** **(3.1%)**	**950** **(5.1%)**	**1,494** **(8.0%)**	**878** **(4.4%)**

Source: Canadian Pulp & Paper Assn.

ISSUE FOCUS: **PULPWOOD PROCESSING**

U.S. SOUTH INCREASES HARDWOOD CHIP EXPORTS TO MEET FAR EAST DEMAND

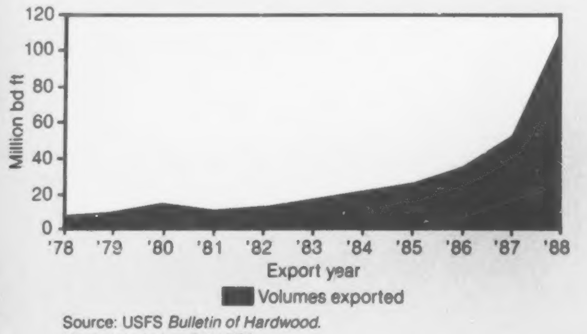
Survey shows that Japan, Taiwan, and Rep. Korea are particularly interested in buying more hardwood fiber from southern producers

By GARY FAULKNER and L. LOUIS HYMAN

In recent months, exports of southern hardwood chips have increased dramatically. Responses to this sudden expansion have ranged from excitement to anxiety. This article examines what is occurring in hardwood chip exports and how these exports are perceived by trading partners in Europe and Asia.

Historically, hardwood log exports have been a steady product from Gulf Coast ports. Log exports to Asia were steady during the early eighties but began an exponential growth in 1985 (Figure 1). The bulk of the early shipments were grade logs sent to make veneer or lumber for the furniture industry. Much of the recent growth in these exports has been in lower-quality pulpwood. Factors cited for these trends include the value of the dollar, international wood availability, improved transportation, and government assistance programs.

FIGURE 1: **U.S. hardwood log exports to Asia were fairly steady until about 1985, when volume began increasing dramatically.**



Source: USFS *Bulletin of Hardwood.*
Market statistics: Fall 1988.
1. Estimate.

CURRENT EXPORT STATUS. The southern hardwood chip export market seems to have evolved from international requests for available market pulp, to hardwood roundwood trial shipments, to the present market activity in exporting hardwood chips. In 1988, a pronounced increase was seen in shipments of southern hardwood chips from the southern U.S. In 1987, Gulf Coast ports shipped 66 tons (dry weight) of woodchips to Europe and Asia. In 1988, this increased to 173,125 tons, nearly all to Asia.

An analysis of customs data from the U.S. Dept. of Commerce Census Bureau and the Journal of Commerce P.I.E.R.S. report shows the destination of hardwood chip shipments. During 1988, 11 chip shipments originated from Gulf Coast ports. Eight of these came from the Mobile (Ala.) Customs District and three from the New Orleans (La.) District. The bulk of these shipments went to Japan, with Taiwan's purchases being less frequent but larger in tonnage. No shipments of chips from Gulf Coast ports to Europe were documented. An additional large amount of wood was shipped from Texas, but this shipment just went across the border to Mexico.

The 173,125 dry-weight tons (312,906 green-weight tons) of woodchip exports is roughly equivalent to 125,162 cords of wood being shipped overseas. The cord equivalent is based on a ratio of 5,000 lb of green weight per cord.

It should be noted that the Gulf Port shipments made up only 8.5% of the total U.S. chip shipments to Japan, but they were 57.7% of the total U.S. shipments to Taiwan. Some dominant factors that draw Pacific Rim pulp mills to southern hardwood chip suppliers include domestic paper demand, existing natural resource bases, and international competitiveness.

WORLD DEMAND. Chip demand is driven by pulp and paper demand. A comparison of apparent per capita paper consumption from selected countries shows little difference in paper use between the developed countries of the Far East and Western Europe. However, this region lacks the strong resource base of Western Europe and North America. For example, Japan has a commer-

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Mr. Faulkner is with the Alabama Development Office and Mr. Hyman is with the Alabama Forestry Commission. This article is based on a presentation made at the American Pulpwood Assn. meeting in Montgomery, Ala., in May 1989.

cial forestland area of 11,300 km^2, Rep. Korea has 60,921 km^2, and Taiwan has only 18,720 km^2. In contrast, Alabama alone has a commercial forestland base of 87,650 km^2 (Figure 2).

It should also be noted that nearly all Asian paper production is used domestically. Japan exports only 3.6%, Taiwan 5.3%, and Rep. Korea 12.6% of their total paper production. In contrast, Fed. Rep. Germany exports 34.1% and Sweden 78% of their paper production.

Of the world's top ten pulp-producing countries, only two, Japan and China, are located in Asia. Japan is the one country among this group that does not have a timber resource base to supply its mills adequately. A closer look at pulp producers in Asia shows six major players (Figure 3). People's Rep. China, India, and Indonesia have a timber resource base. Japan, Taiwan, and Rep. Korea are major pulp producers who do not control an adequate timber base. These countries are dependent on imported roundwood and chips to fully supply their mills.

WORLD MARKET SURVEY. To analyze the demand for southern hardwood chips in Europe and Asia and to learn the viewpoint of potential trading partners, the Alabama Development Office (ADO) recently conducted a survey of major pulp and paper companies in Europe and Asia. This information was combined with an existing pool of data from recent international forest products investment prospects.

The survey was designed to determine if these companies import hardwood chips from the South, whether or not southern hardwood chips are acceptable in their processes, what chip characteristics they require, from which ports would they prefer to ship, and if they foresee any increase in their use of southern hardwood chips.

The survey showed that there is only a slight demand for southern hardwood chips in Europe. Some countries in Western Europe do import chips but mostly from each other. Fed. Rep. Germany exports chips. Some interest in southern hardwood chips is seen in Switzerland. But the bottom line is that there is no significant market interest in importing southern hardwood into Europe. On the other hand, the Far East is very interested in southern hardwood chips, according to the survey. The three main markets are Japan, Taiwan, and Rep. Korea.

FAR EAST MARKETS. Japan's pulp industry dominates the Far East. Japan has been importing woodchips and roundwood pulpwood since the 1960s. The Japanese pulp industry is in an expansion phase, especially in bleached hardwood kraft pulp. This expansion is being pushed by increases in domestic consumption as the Japanese economy continues to boom. Japanese companies are expanding because of these increases in demand, lower energy costs, lower raw material costs, and modernization programs to streamline their operations.

Japan relies heavily on imported hardwood logs and chips to supply its pulp mills. It buys chips from several sources (Figure 4). Australia is the dominant source, followed by the U.S. South and Chile. Besides chip purchases, many Japanese firms are interested in making direct investments in chip making and other manufacturing facilities. The Japanese also prefer long-term (five-year) contracts.

The economy in Taiwan is currently going through a transition. The majority of Taiwanese exports went to the U.S., and the decline of the U.S. dollar against the NT dollar has slowed exports and the economy. In addition, a lowering of import tariffs has increased paper and board imports. Taiwan has three pulp mills: two that produce bleached kraft pulp and one that makes dissolving pulp.

In response to the ADO survey, Taiwanese fiber importers reported great interest in southern hardwood chips, at least for the short term. The main reasons are price, quantity, and species quality. They have not selected any particular port for shipping; the decision is

FIGURE 2: **A major reason why Rep. Korea, Taiwan, and Japan import a great deal of hardwood is their lack of commercial forestland.**

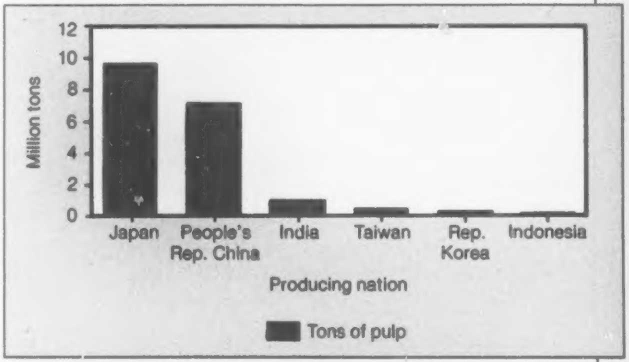
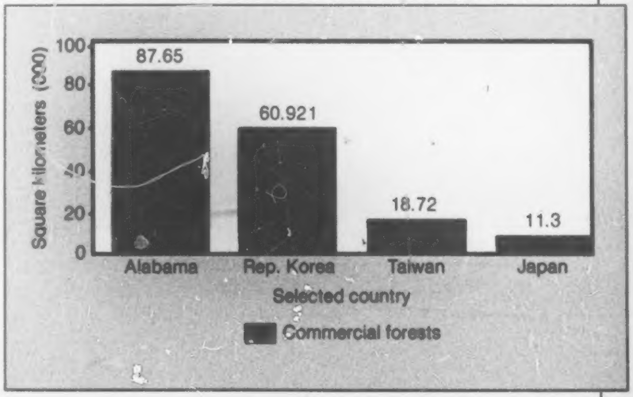


FIGURE 3: **According to 1987 figures of pulp production in Asia, three of the six major producers are importing a majority of pulp.**



based on the cost-effectiveness of each shipment. Currently, Taiwan imports wood from Indonesia, Malaysia, Thailand, Australia, South Africa, and the U.S. Although the southern U.S. has the longest shipping distance of these suppliers, Taiwanese companies expect to increase their purchase of southern hardwood chips, according to the survey.

Rep. Korea is another example of a country with a very strong, export-oriented economy and few natural resources. Rep. Korea has five pulp mills, of which only one produces bleached kraft pulp. The other four produce groundwood pulp.

One Korean firm projected hardwood chip needs to exceed 200,000 bone-dry tons on an annual basis by 1991. Another firm is interested in moving a pulp mill to the U.S. or Canada in the near future. The mills are interested primarily in oak and are attracted by the South's strong oak reserves. The Koreans have shipped chips from Mobile and are very satisfied, indicating a large increase in the use of southern hardwood chips in the near future. They currently import hardwoods from the U.S., Australia, and Indonesia. Korean producers look to the southern U.S. as a long-term supply base and are willing to set up their own southern U.S. operations to meet their needs.

FACTORS INFLUENCING EXPORTS. An evaluation of these data shows that four main factors influence southern hardwood chip exports. The first is that the market for southern hardwoods has been remarkably stable during the past ten-plus years (Figure 5). This is true on both the stumpage level and the delivered-to-the-yard cost level. This shows the relative abundance of hardwoods in the South and the historically low demand for hardwood pulpwood. The price jumped in 1987 because of increased demand but has since leveled off due to an increased supply and a weaker dollar.

The mid-South has an excellent transportation infra-

FIGURE 4: **Japan, as the major pulp producer in Asia and the major woodfiber importer, gets most of its hardwood chips from Australia, followed by the U.S. South.**

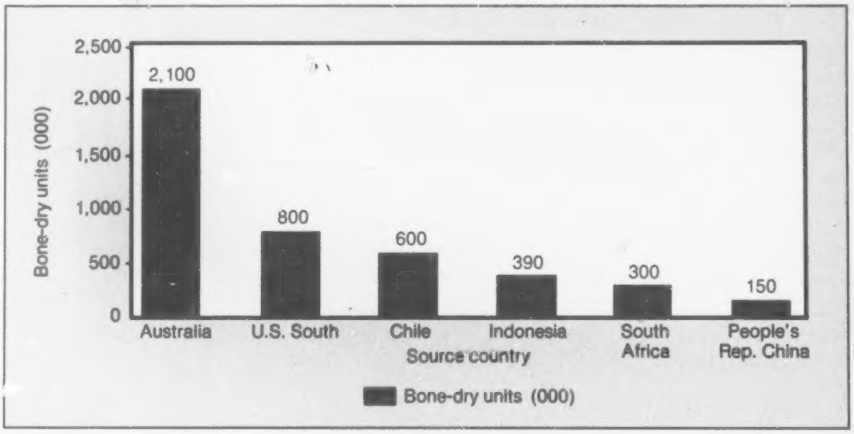
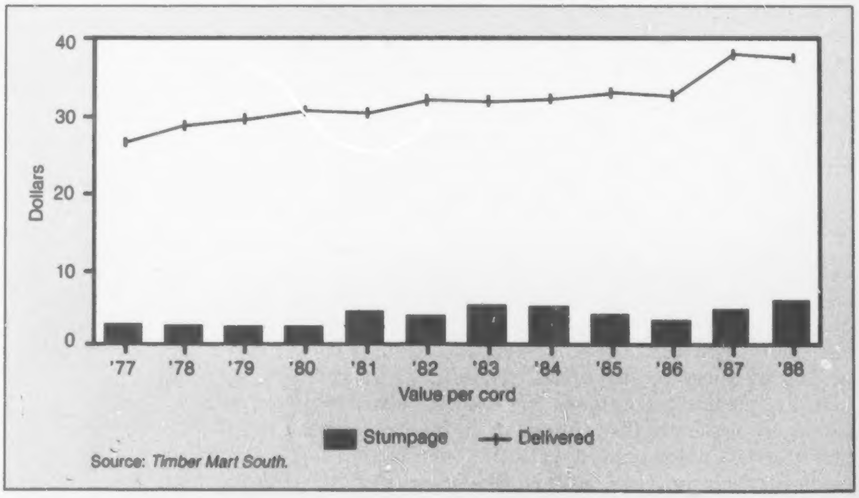


FIGURE 5: **The market for southern hardwood has been stable during the past ten years, represented by average hardwood pulpwood prices in Alabama from 1977-88.**



Source: *Timber Mart South.*

Southern woodchip supply

The USDA Forest Service estimates that during the next 20 years, the U.S. South will continue to be a major world supplier of softwood and hardwood logs. However, the region's hardwood reserve will decrease gradually because many of the hardwood forests (after harvest) will be replaced by softwood plantations. For the next ten years, however, the South will still have large hardwood reserves, with annual harvesting far behind annual growth. The following figures show the Forest Service's most recent estimates (units in million m^3):

Southern region	**1988**	**2000**	**2020**
Annual growth	125	120	110
Annual harvest	81	98	135
Difference	44	22	−25

According to these figures, some 22 million m^3 of hardwood logs will be available for additional harvesting at the turn of the century. Figuring that one bone-dry unit (bdu) of woodchip volume is about 160 ft^3, and based on the conversion of 72 m^3 of solid wood to 100 m^3 of woodchips, about 120 ft^3 (or 3 m^3) of solid wood is needed to produce one bdu of woodchips. This means that by the year 2000, about 7 million bdu of woodchips will be available for additional harvest, which is equivalent to approximately 16 million tons of woodchips. This is above the estimated 3-million-tpy demand from the Far East market.

The increasing harvest of southern hardwood logs for export may reduce the surplus of the forest reserve at a faster rate than the Forest Service estimates. However, the 3 million tons of export demand represent only about 3% of the 2000 growth volume. This impact should be manageable. Therefore, it is safe to say that for the next ten years, the hardwood log supply in the South should be abundant enough to cover both domestic and export markets.

CURRENT SITUATION. At the peak of southern pine export to Scandinavian countries in 1981, volumes reached about 740,000 bone-dry tons. Major export ports were Savannah, Ga.; Mobile, Ala.; and Lake Charles, La. Since the Finnish embargo (due to the threat of nematode infection) in 1985, this export activity has stopped, idling many of the chip mills and port loading facilities. However, last year's woodchip exports to Taiwan and Japan rejuvenated many of those facilities, especially the ports of Savannah and Lake Charles and the chip mills surrounding them.

The current exporting of woodchips from this region began last spring. Wintech Co. and Garick Corp. at Savannah's chip terminal began exporting chips to Taiwan. And Weyerhaeuser Paper Co. began delivering chips to Japan from the Port of Mobile, followed by Scott Paper Co. at Mobile and Louisiana-Pacific Corp. at Lake Charles. With the activation of old chip mills and port terminals in addition to a few new facilities throughout the South, current woodchip export capacity is estimated at more than 3 million tpy. The following provides a rough estimate on each company, its exporting port, and capacity:

- Weyerhaeuser so far is the leading exporter of woodchips in the West and South. Currently, it has one shipment per month scheduled from Mobile. Another chip terminal is being planned for Moorhead City, N.C. The combined capacity of these facilities could reach 600,000 to 800,000 tpy.
- Scott at Mobile is the most promising woodchip exporter in the South. It owns more than a half-million acres of forestland and has a chip mill that is dedicated to export business. Scott is also constructing a chip terminal at Mobile and has a large fleet of barges and towboats. Its production cost and capacity will be the most competitive in the region. Currently, its capacity is about 400,000 tpy.
- In Savannah, the chip terminal exported more than 1 million tpy in the previous pine chip business. In its surrounding area, no shortage of chip mill capacity exists. Currently, three companies are using this terminal: Germain Co., Wintech, and Fexcorp Co. The combined export capacity of these companies is about 1.0 to 1.2 million tpy.
- Louisiana-Pacific at Lake Charles owns a chip terminal similar to Savannah's facility. Its primary chip supply is from East Texas and Louisiana. L-P probably can handle 350,000 to 400,000 tpy.
- At Reserve, La., is a general bulk cargo handling facility on the banks of the Mississippi River. Chips are handled through this facility by a group of sawmill operators in Mississippi. The facility's annual capacity is about 400,000 tpy.
- Many other companies and ports in the South are interested in the woodchip export business. Alabama State Dock is planning a new chip terminal at Mobile, and Fulghum Co.'s Meridian, Miss., chip mill is planning to use this facility to export chips to Japan. Another bulk terminal in Brunswick, Ga., is being used by Stone Forest Industries Ltd. to sell woodchips to Mitsubishi Co. These facilities have a combined total capacity of about a half-million tpy.

These operations represent a total of about 3.3 million to 3.8 million tons of annual capacity for export. This capacity level would be enough to cover any current and future demand. Actually, the current export woodchip supply capacity is well above the demand from the Far East. Many suppliers are competing for the same buyers, such as Marubeni, Mitsubishi, C. Itoh, Sumitomo, Sanyo-Kokusaku Pulp, and Taio Pulp. Until deals can be settled in the latter half of this year, the oversupply situation will keep the market soft. No shortage of chip supply yet exists.

—By Paul Kao, GPS Co., Houston, Texas. Extracted from a presentation at the American Pulpwood Assn. meeting at Montgomery, Ala., in May 1989.

structure. The opening of the Tennessee-Tombigbee Waterway has greatly increased companies' ability to move wood supplies greater distances at lower costs. Wood has become one of the dominant items of commerce utilizing the Waterway (Figure 6). The Tenn-Tom enables companies to move efficiently high-volume, low-value products, such as roundwood or chips, a great distance. This has significantly increased the amount of wood that can be brought to the Port of Mobile at a price exporters are willing to pay.

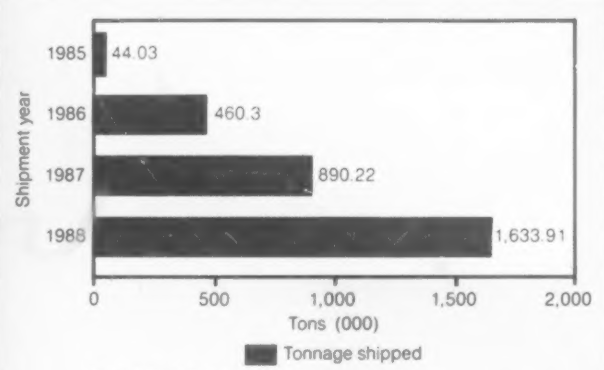
Another major factor influencing hardwood chip exports is the exchange rate of the dollar. The recent decline in the value of the dollar (since 1985), especially against the yen (Figure 7), has increased the buying power of foreign pulp mills. A yen now buys more wood than it did previously.

The final factor is competition from other growers that are exporting hardwood chips to Asia. The main competition is eucalyptus from Australia and South America, especially Chile. Changes in the availability of logs and chips from these sources have had and will continue to have an impact on the demand for southern hardwood chips.

CONCLUSIONS. The viewpoint of southern U.S. trading partners in Europe and Asia concerning southern hardwood chip exports can be summarized from the ADO survey as follows:

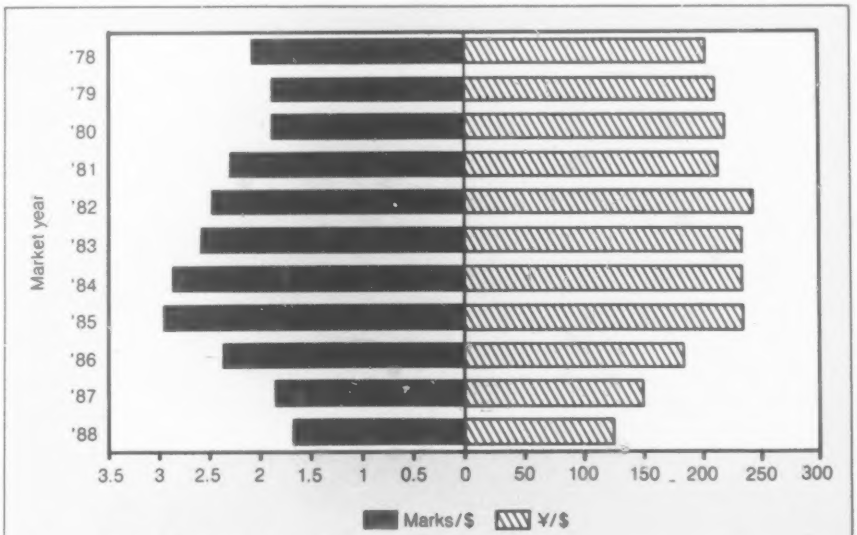
- Europe presently is not a market for southern hardwood chips.
- The Pacific Rim is a promising market for southern hardwood chips, at least for the near term.
- This demand from the Pacific Rim is being driven by domestic consumption of paper as well as changes in roundwood and chip supply availability in other parts of the world.
- The southern U.S. is a prime source for hardwood chip exports; the stable local market, excellent ports, and good river transportation systems result in relatively lower alongside-ship prices.
- Pacific Rim countries are aware of this great resource and are trying to increase their use of it through either export purchases or direct investments in processing facilities. ■

FIGURE 6: **One of the indicators of the good transportation in the U.S. South is the growth in the amount of wood shipped on the Tennessee-Tombigbee Waterway.**



Source: Tenn-Tom Waterway Development Council.

FIGURE 7: **The decline in the value of the U.S. dollar against the yen has increased the buying power of foreign pulp mills.**



Source: USFS *Bulletin of Hardwood.*
Market statistics: Fall 1988.

NEWSPRINT PRODUCERS CONCERNED AS STATES EYE TAXES, RECYCLING GOALS

Legislators consider newsprint market as largest, most probable end user for newspaper that is generated by recycling programs

By DEBRA A. GARCIA, Senior News Editor

Newsprint producers are becoming concerned about the trend emerging among states to provide incentives for using recycled paper. Newsprint has been among the first targets for legislators looking for ways to ease the garbage crisis because it is the single largest end-use market for the single greatest component of the solid waste stream: old newspaper. Each year, the U.S. generates more than 160 million tons of solid waste. Of this amount, about 8.5 million tons are made up of old newspaper.

Laws that tax virgin-fiber newsprint and set mandatory recycling levels are seen by states as a way to reduce the growing pile of old newspaper that *they* cultivated through mandatory recycling bills. Regulating recycling at the curbside level wasn't the answer; it only pushed the problem down the solid-waste stream, from the landfill to the recycling center. And if states proceed with proposed legislation, paper mills will have to deal with the problem.

That is, if lawmakers don't first recognize that market imbalances cannot be corrected with legislation alone. "The market should be market driven, not supply driven," noted Rod Edwards, vice president-paperboard, American Paper Institute. "Recycling is not a magic bullet that's going to save us," agreed Steve Levetan of the Institute of Scrap Recycling Industries. "It took us years to get into this mess, and it's going to take us years to get out of it."

Municipalities initially believed that recycling would be cost-effective, and some even thought it could turn profitable. But in a market downturn, such as the one the wastepaper industry is beginning to feel, municipal recycling programs have tended to lose money. By creating markets for recycled products, states believe they can eliminate these glitches in the demand for recyclable materials.

EXCELLENT TRACK RECORD. Unfortunately for the newsprint industry, the success of newsprint in recycling has made it an easy target for legislators. It's among the easiest elements in the garbage heap to recycle and

TABLE 1: **North American recycled newsprint producers.**

Company and location	Capacity (metric tpy)	Recycled content (%)
United States		
FSC Paper Co.		
Alsip, Ill.	107,000	100
Garden State Paper Co.		
Garfield, N.J.	197,000	100
Golden State Newsprint Co. Inc.		
Pomona, Calif.	121,000	100
Manistique Papers Inc.		
Manistique, Mich.	53,000	100
Smurfit Newsprint Corp.		
Newberg, Ore.	350,000	50
Oregon City, Ore.	211,000	50
Southeast Paper Manufacturing Co.		
Dublin, Ga.	395,000[1]	100
Stone Container Corp.		
Snowflake, Ariz.	258,000	50
Canada		
Atlantic Packaging Corp.		
Whitby, Ont.	136,000[2]	100
Quebec & Ontaric Paper Co.		
Thorold, Ont.	305,000	50

1. Includes 190,000-tpy-newsprint machine starting up September 1989.
2. Greenfield mill starting up mid-1990.
Sources: Newsprint Information Committee, *Pulp & Paper Week* estimates.

already has a huge recycling infrastructure. Last year, 4.7 million short tons of old newspaper were reused in some form in the U.S., representing a recycling rate of 35% of all newspaper discarded—one of the highest of any commodity.

The problem is that demand from end users is not increasing as rapidly as the recovery rate. Over the five-year period from 1983 to 1988, newspaper recycling has grown twice as fast as newsprint consumption. Because of this, states want to make sure that recycled newsprint at least has a bigger share in whatever gains in consumption are achieved.

According to James Hutchison, vice president-paper, API, about 1.5 of the 5.5 million tons of 1988 U.S. newsprint capacity contained at least some portion of recycled newspaper (Table 1). That's more than a quarter of the total but is still far short of what will be needed if enough states move forward with market-enhancement legislation.

Florida was the first to enact some form of tax on virgin newsprint. The bill, which took effect on Jan. 1, requires all newspaper publishers in the state to pay a 10¢/short-ton tax on virgin-fiber newsprint and to recycle half of all discarded newspaper by Oct. 1, 1992. Although the initial intention was to control the state's garbage problem, other states are realizing the potential such bills have to enhance markets for waste-based newsprint and are considering their own versions of the Florida bill.

INDUSTRY TAKES A CLOSER LOOK. At the same time, a number of companies and associations have begun in recent months to take a closer look at the implications for paper and related industries—especially newsprint and newspaper. The American Newspaper Publishers Assn. (ANPA) has formed a task force on newsprint disposal headed by Frank A. Bennack Jr., president, Hearst Corp.

At this time, no collaborative effort among newsprint mills to tackle the problems this legislation could pose has emerged, however. Instead, individual companies have decided to conduct studies at their own mill locations on the "availability, cost, consumer acceptability, and public cooperation associated with the source, separation, collection, and deinking of old newspaper," API noted.

In the U.S., Bowater is one of the major suppliers studying possible ways to incorporate more recycled newspaper into its production. Its interest "stems not from any shortage of its regular sources of fiber but from its awareness of the growing pressure on municipalities to reduce the volume of waste material requiring disposal in landfills," the company said.

In Canada, Abitibi-Price Inc. has begun studying ways to either incorporate more wastepaper at its existing facilities or build new mills. Donohue Inc., however, decided last year against installing a deinking facility at its Clermont, Que., mill, choosing instead to expand thermomechanical pulping capacity.

ARE STATES' GOALS REALISTIC? Levetan noted that Florida's 50% recycling goal is attainable if new markets are developed. But the 10¢/short-ton tax on virgin newsprint consumed—which publishers can offset with a 10¢/short-ton credit on recycled newsprint used—is not likely to be enough of an incentive to significantly expand markets.

In Connecticut, a bill was proposed that would impose a tax of $20/short ton on nonrecycled newsprint consumed, effective July 1990. This would increase to a tax of $40/short ton in July 1991 and $60/short ton in July 1992. The proposal was later dropped from the legislation in favor of voluntary recycling goals.

The Connecticut bill stipulates that recycled newsprint must contain at least 40% old newspaper, unlike Florida's legislation, which does not designate any standard for recycled content. Most states considering this type of legislation, including California, are looking at a level of 40% because it is the standard in the model federal bill, the Resource Conservation & Recovery Act.

California is currently considering a bill to impose quotas on the amount of total newsprint consumption that would have to be recycled-fiber based. The quotas would escalate from 25% of total consumption effective Jan. 1, 1991, to 50% effective Jan. 1, 2000. Failure to comply would result in fines. Wisconsin lawmakers are looking at a bill that would require newspapers to use recycled newsprint for at least 10% of their total requirements, moving up 10% each year to 50% by 1994.

Other states considering some form of market-enhancement bill involving newsprint include New York, Connecticut, Nebraska, and Pennsylvania, according to Tonda Rush, director-newspaper planning and projects, ANPA.

These states and others are also proposing or have already passed some form of solid-waste legislation that could effect the newsprint industry. Last year, Pennsylvania passed a law that will require recycling of newspapers and other materials by all municipalities of 10,000 or more population by September 1990. Communities with between 5,000 and 10,000 people must start their programs a year later. New Jersey was the first state to mandate curbside recycling several years ago.

INDUSTRY OPPOSED TO NEWSPRINT TAXES. Garden State Paper Co., the largest recycled newsprint producer in the U.S., expects that newsprint taxes will become more widespread but hopes that lawmakers take into account the potentially disastrous consequences of poorly considered laws to the marketplace.

GSP and Southeast Paper Manufacturing Co. are opposed to the proposed newsprint and recycling bills that do not consider the industry's capacity to meet demand. "Laws that address the solid-waste crisis are fine, but

Bales of old newspaper are warehoused at Southeast Paper Manufacturing Co.'s Dublin, Ga., mill, where a second newsprint machine is scheduled to come online this September (photo courtesy of BE&K Inc.).

they have to be realistic enough to allow publishers and paper manufacturers to conform to them," said James L. Burke, executive vice president and general manager, GSP.

Not only will the paper industry need a phenomenal capital investment to engineer and build secondary fiber capacity, but it will take at least three years for the first phase of this massive industry makeover to become operational, as industry sources have pointed out.

A good sign, though, has been lawmakers' increasing openness to the industry's side of the problem. "They're at the point of scratching their heads and saying, 'Something is not working here,' and trying to get the paper industry to tell them more about what's necessary to make it work," Rush said. For instance, Pennsylvania has formed a state task force headed by Lt. Gov. Mark S. Singel and is talking to newspapers about using more recycled newsprint.

Perhaps this will lead to a better understanding of what will really enhance the market. "The thing they're missing is that rather than make demands on newspaper publishers, they need to: one, convince newspaper publishers there really is a solid-waste crisis; two, convince them that the incorporation of secondary fiber can help; three, get newspaper publishers to encourage the use of more newsprint made out of secondary fiber," said Burke.

WHAT ABOUT LONG-TERM DEMAND? The trend to use more recycled newsprint is going to increase in the short term, according to Rush. Whether it will grow long-term, however, "will depend on what feasible disposal options emerge from the states." One problem is that newsprint fibers wear out after repeated recycling. Thus, states will have to provide other disposal options.

Newsprint producers and consumers are beginning to see that they have a mutual interest in showing legislators that newsprint tax/recycling laws could be disastrous. Together they are trying to work out a better solution to the waste problem.

In Long Island, N.Y., where the garbage buildup is reaching crisis proportions, *Newsday* publisher Robert Johnson told a group of paper industry executives at API's newsprint division meeting in March that his newspaper was committed to buying recycled newsprint. He is convinced other publishers will do the same.

Part of the incentive in the New York metropolitan area has been soaring newsprint disposal costs. For example, in nearby Newark, N.J., the cost of garbage disposal has risen from about half a million dollars in 1979 to $24 million last year. Most landfills in the region have been closed in recent years, and garbage must be transported hundreds of miles away for disposal.

In Illinois, local officials want FSC Paper Co.'s Alsip, Ill., recycled newsprint mill to use more old newspaper. The *Star-Tribune* in Minneapolis, Minn., though, has agreed only to gradually increase its use of recycled newsprint because of long-term newsprint supply agreements and technical problems linked with using recycled newsprint. Also, the newspaper is opposed to creating a market without sufficient local capacity to fill it.

Recognizing that the solution must start with either the suppliers or the consumers, Rush suggests that newspapers begin by expressing an interest in using more recycled newsprint. Even manufacturers already making recycled newsprint are hesitant to invest heavily in projected future demand that may be subject to the whims of legislators.

PROBLEMS WITH LEGISLATING MARKETS. Trying to regulate the wastepaper industry with mandatory curbside collection programs has already caused a glut of old newspaper in such metropolitan markets as New York and Toronto, Ont. In Ontario, the provincial government recently paid a deinking and recycling paper plant in Quebec to take excess old newspaper.

Wastepaper recycling has grown in the Toronto area as a result of the "blue-box" recycling program instituted several years ago. More wastepaper is generated than can be used locally, resulting in most of it being exported to the U.S., Europe, and the Pacific Rim at reduced profit levels for recyclers. The only major consumer of old newspaper in the Toronto region is the *Toronto Sun*.

State interference in the paperstock business has also created fiber quality problems for some mills, such as GSP's Garfield, N.J., mill and Southeast's, Dublin, Ga., mill. Educating municipalities about separating newspaper from other paper and contaminants will be one challenge to be met if more secondary fiber is to be suitable for recycling, noted Rush. "Good-quality fiber will always find a market," said Burke.

QUALITY FIBER IS THE KEY TO SUCCESS. GSP has seen the quality of its paperstock degenerate in direct proportion to the number of municipalities getting into the recycling business. Households often consider everything wrapped in the morning paper to be newsprint. As a result, other paper grades are mixed in, as well as contaminants. Thus, fiber quality must be downgraded to mixed paper and the price lowered. "We're having to reeducate the municipalities in what they have to do if they are to find a market for their products. I think it will improve over time," said Burke.

Another viable solution is working with the existing paperstock dealers' network "that is out there and knows how to process and pack the paper for shipment to a deinking mill," noted Levetan. "When you get to the mill, the paper machine doesn't know where it came from. You cannot sacrifice quality in the name of a municipal recycling program."

But even as publishers are being drawn more into recycling, their quality standards for newsprint are moving them in another direction. Publications such as *USA Today*, which set the standards for four-color printing, reportedly won't run recycled newsprint. Yet, Southeast claims its paper already meets *USA Today* standards, GSP's Garfield mill expects to match those specifications with various upgrades in machinery, and a number of other producers say they meet or exceed average standards of the pressroom.

One paper industry executive noted that the mills would be forced to meet top quality standards with recycled newsprint. Still, it will take time not only for the technology to advance but also for the product to gain widespread acceptance.

COMPLIANCE MAY NOT BE ATTAINABLE. Even so, many mills in North America are not likely to add deinking plants. Aside from the investment and time required to incorporate a secondary fiber system, a mill must be close to a good source of wastepaper. In Canada, many mills are isolated. According to Gordon Minnes, executive vice president, Canadian Pulp & Paper Assn., using secondary fiber is not feasible for these mills, which are surrounded by abundant pulpwood supplies. For the present time, the association is watching developments in the U.S., he indicated.

Canada, which supplies about 57% of total U.S. newsprint demand, currently has only one mill making recycled newsprint—Quebec & Ontario Paper's Thorold, Ont., mill. A second is being built by Atlantic Packaging Products Ltd. in Whitby, Ont., and is scheduled to start up next July with a capacity of 136,000 metric tpy of 100%-recycled-content newsprint. The new machine is expected to use approximately 163,000 metric tpy of old newspaper and coated magazine sections. It should absorb all excess old newspaper generated by Ontario's blue-box program and then some.

Statistics show that Canada trails far behind the U.S. in recycling paper and paperboard. Only 5% of Canada's newsprint capacity is currently waste based, compared with 25% in the U.S. Yet, only 60,000 tpy of the Thorold mill's output is sold in Canada.

Minnes noted that Canada's vast forests and smaller population make the need to conserve fiber slower to be recognized. Canada reportedly recycles just 2% of its 35 to 40 million tons of garbage each year. But federal and provincial governments recently agreed to cut Canada's garbage in half by the year 2000 and expect to have a plan for attaining that goal by mid-1990.

At the same time, Toronto publishers are talking with suppliers and the provincial government about ways to put recycled newsprint on the presses within two years. The total consumption of Toronto newspapers would be an estimated 250,000 tpy.

Regardless of the intent of all involved in this issue of supply and demand for recycled newsprint, Minnes noted, "The handling capacity and infrastructure are simply not in place to use it. It will take time." In the U.S., the recycling industries are more entrenched than in Canada. Source-separation programs were initiated in some metropolitan areas years ago, but even the U.S. paper industry cannot fulfill the dreams of lawmakers.

Atlantic Packaging and Southeast are the only two of the 11 newsprint machines coming online in North America during 1989-91 that are recycled-fiber based (Southeast's new 190,000-metric-tpy newsprint machine is expected to start up this September). This amounts to less than 15% of all the new newsprint capacity (plus incremental increases) coming onstream before 1992—hardly enough to meet the demand legislators have proposed to mandate. ■

PULP & PAPER
August 1989

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WORLD REVIEW

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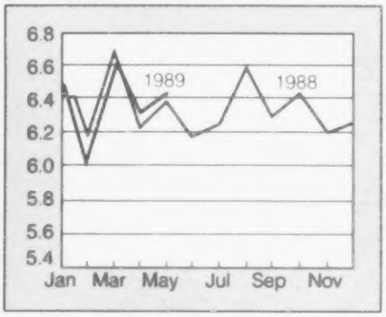
MONTH IN STATISTICS



U.S. paper and board production

U.S. production of paper and paperboard totaled 6.4 million tons in May, down 0.3% from the same month last year, according to the American Paper Institute. After seasonal adjustments, overall production was 0.9% lower through the first five months than in 1988, reflecting the slowdown that has overtaken the general economy. Lower demand and inventory trimming led to a 1.5% decline in paper production through May. Paperboard production was off just 0.2% over the same period, thanks in part to continued strength in export markets.

Among major grades, uncoated groundwood and tissue were the only paper grades showing higher production levels than last year. Printing and writing paper was off 1.7%, with lower volumes for most end uses. Containerboard production held steady compared with last year, and fiber box shipments were up 1.9% after adjusting for an extra day this year.

Canadian newsprint shipments totaled 851,000 metric tons in May, down 0.6% from last year. Downtime at eastern mills has lowered operating rates for the first five months to 96%, down from 100% a year earlier. Pulp shipments totaled 640,000 tons, down 6.3%, with mills operating at 90% through May. ■

	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION[1]					
Newsprint	May	504	-1.9	5,922	-1.2
Uncoated groundwood (s)	May	142	5.2	1,730	8.1
Coated paper (s)	May	577	-4.0	6,978	-5.9
Uncoated free-sheet (s)	May	937	1.7	11,280	-0.5
Other printing / writing	May	126	-0.8	1,525	-0.7
Total packaging and other paper (s)	May	395	-5.7	5,029	-4.8
Tissue	May	474	2.8	5,592	2.6
Total paper	**May**	**3,155**	**-0.7**	**38,056**	**-1.5**
Unbleached kraft paperboard	May	1,681	1.8	19,441	0.2
Semichemical medium	May	468	4.7	5,708	1.5
Bleached paperboard	May	382	6.1	4,440	-1.7
Recycled paperboard	May	735	-3.4	8,778	-2.7
Total paperboard	**May**	**3,265**	**0.0**	**38,366**	**-0.2**
Total U.S. paper and paperboard output	**May**	**6,421**	**-0.3**	**76,422**	**-0.9**
PULP, WASTEPAPER & FIBER[2]					
Total U.S. woodpulp production	Apr.	5,193	3.8	62,361	1.8
Market pulp production	Apr.	717	6.1	8,858	4.1
Wastepaper consumption at paper / board mills	Apr.	1,550	0.6	18,674	-0.4
Pulpwood consumption (cords)	Apr.	8,040	-1.2	97,212	0.1
CONVERTED PRODUCTS STATISTICS[3]					
Corrugated box shipments (billion ft^3)	May	26.734	6.8	130.633[6]	1.8
Containerboard inventories at U.S. box plants and mills	May 1	2,564	0.5		
INTERNATIONAL TRADE[2]					
U.S. paper imports (including products)	Apr.	1,045	-1.7	12,711	-1.1
Imports of Canadian newsprint	Apr.	667	-2.9	7,889[6]	-7.9
U.S. paper exports (including products)	Apr.	489	-1.2	6,171	9.4
Exports of unbleached kraft linerboard	Apr.	167	-18.5	2,262	0.9
Exports of woodpulp	Apr.	525	15.9	6,334	18.7
Norscan pulp inventories[4]	May 31	844	8.6		
Norscan pulp operating rates[4]	May	95 %	96 %	97 %	98 %
CANADIAN STATISTICS[5] *(reported in metric tons)*					
Total newsprint shipments	May	851	-0.6	3,943[6]	-2.0
Operating rates	May	95 %	100 %	96 %	100 %
Inventories held by U.S. consumers	May 31	1,296	-14.0		
Other paper / board shipments	May	576	-0.9	2,773	-1.0
Woodpulp shipments (export only)	May	640	-6.3	3,276	-1.2
Operating rates	May	89 %	93 %	90 %	95 %

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American / Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

Corrugating medium: High operating rates for semichemical mills but prices competitive

Grade structure: Corrugating medium, the middle fluting material used in corrugated containers, is made from both semichemical pulp and recycled fiber. In 1988, 76% of corrugating medium was made from semichemical furnish (which normally contains at least 20% recycled fiber), and 24% was "bogus" medium made from wastepaper. Basis weights of corrugating medium are 22, 26, 33, 36, and 40 lb/1,000 ft².

Standard sheet weight is 26 lb, which accounts for about 77% of production (although heavier weights have been growing in popularity). Recycled medium for equivalent uses is normally produced in slightly higher weights.

Production/capacity: U.S. production of corrugating medium rose 3.9% in 1988 to 7.4 million tons from the previous year. Semichemical medium production rose 2.3%, while recycled medium output surged 9.3%, reflecting a tight supply situation that prevailed through the first half of the year. Slower corrugated box shipments in the second half of the year caused medium supply to ease late in 1988. However, operating rates for semichemical mills still averaged 98% for the year, while recycled mills ran at 95%.

This year, the market is expected to ease further, with U.S. corrugated box shipments projected to show about a 1.8% gain compared with a 3.6% increase in 1988. Production of corrugating medium is expected to be up 0.4% in 1989, with semichemical medium showing a 1.3% increase while recycled medium is down 2.4%. As a result, semichemical medium mills are projected to run at nearly 96%, while recycled mills average 84%.

Outlook: With an economic slowdown but no recession forecast for 1990, box shipments are expected to be up less than 1% for the year. Corrugating medium production is projected to increase 0.7% with all of the growth in semichemical board. This would cause operating rates of semichemical mills to slip to under 94%, while recycled mills average 81%.

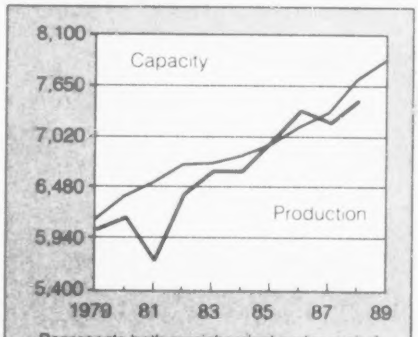
The last American Paper Institute capacity survey showed capacity for semichemical medium rising 3.2% in 1989 and 2.9% in 1990, while recycled medium jumps 10.2% this year and 3.5% next year. Actual capacity growth, however, may be somewhat slower, particularly for recycled medium with the closure of three recycled medium mills, partly offset by the shift of one West Coast medium machine from semichemical to recycled production.

No new semichemical medium machines have been announced in the U.S., although several companies are planning major rebuilds for completion over the next several years (including Mead Corp., Temple-Inland Inc. at two mills, Green Bay Packaging Inc., Virginia Fibre Corp., and Menasha Corp.), while at least two more have projects under study. A number of these projects include installation of wide-nip presses to improve quality and add incremental capacity. In recycled medium, Stone Container Corp. is expanding an existing mill, while two or three new mills are under study (one is the reactivation of an older mill).

Prices. Although linerboard producers unsuccessfully tried to push through a $30/ton price increase this spring, there was never even much hope that medium prices would rise. The softness in medium prices appears to reflect the easing in operating rates (particularly for recycled mills) and lower wastepaper costs. There has also been continued pressure from Canadian medium imports in the North and imports from Mexico along the border states. As a result, medium prices are currently $20 to $30/ton or more below list levels.

Year-end transaction price history for 26-lb semichemical medium in the East is as follows: 1984, $310; 1985, $240; 1986, $290 to $300; 1987, $350 to $360; 1988, $380 to $390 (vs the $410 list). Recycled medium may sell for $10 to $20 less, depending on quality and market conditions. *For additional information, see P&P FactBook.*

SUPPLY/DEMAND (000 tons)



Represents both semichemical and recycled.

FORECAST (000 tons)

	1988	1989e	1990e
Production			
Semichemical	5,666	5,740	5,790
Recycled	1,757	1,715	1,715
Total	**7,423**	**7,455**	**7,505**
Capacity[1]			
Semichemical	5,796	5,987	6,160
Recycled	1,850	2,038	2,110
Utilization rates			
Semichemical	97.8%	95.9%	94.0%
Recycled	95.0%	84.2%	81.3%
Imports[2]	142	140	140
Exports[3]	136	140	150
Apparent U.S. consumption			
000 tons	7,429	7,455	7,495
lb/capita	60.50	60.30	60.00
GNP ratio[4]	1.87	1.78	1.76

e = Estimate.

1. Based on American Paper Institute 1988 capacity survey. **2.** Dept. of Commerce data. **3.** API data. **4.** 000 tons/billion $ real GNP (1982$).

TOP U.S. PRODUCERS (000 tpy)

Company	Annual capacity Semichem	 Recycled medium	 Total	Market share (%)
1. GNN	980	—	980	12.2
2. Stone	680	180	860	10.7
3. Weyco	690	—	690	8.6
4. Inland	205	275	480	6.0
5. Smurfit	60[1]	330[1]	390	4.9
6. Mead	390	—	390	4.9
7. IP	[illegible]	—	370	4.6
8. PCA	28[illegible]	—	280	3.5
9. G-F	27[illegible]	—	275	3.4
10. Va. Fibre	2[illegible]	—	265	3.3

Market share of top five companies: **42.4%**
Market share of top ten companies: **62.1%**
Total U.S. capacity (1989):
8.025 million short tons

1. Includes 50% of Container Corp. of America.
2. Includes 50% interest in 170,000-tpy semichemical medium machine at Sonoco Products Co.'s Hartsville, S.C., mill.

NEWSPRINT

Smurfit, GSP stake out mill sites in Northeast

The two largest recycled newsprint producers in North America recently announced tentative plans to increase their operations more with greenfield mills somewhere in the northeastern U.S. In addition, at least five other North American newsprint producers that are not using any secondary fiber currently are seriously considering some type of expansion into recycled newsprint, with at least one looking at an eastern U.S. location, according to industry sources.

Smurfit Newsprint Corp. has announced that it will complete a feasibility study on a 255,000-metric-tpy recycled newsprint mill somewhere in the U.S. Northeast. Garden State Paper Co. said it is also studying a greenfield recycled newsprint mill in the same region.

"Several northeastern states have expressed a strong desire that a mill be built 'to create a market that will absorb the recycled waste newspaper from overloaded solid waste disposal programs,'" according to Basil Snyder Jr., GSP's chairman and CEO. "A new mill could at least double the size of the market for waste newspaper in the Northeast," he added.

At this time, GSP produces 200,000 metric tpy of recycled newsprint (using about 230,000 tpy of old newspapers) at its Garfield, N.J., mill. In addition, GSP's parent company, Media General Inc., retains a one-third interest in Southeast Paper Manufacturing Co.'s Dublin, Ga., recycled newsprint mill. It will have a capacity of 415,000 tpy when a second machine comes online later in September.

Smurfit Newsprint, a subsidiary of Jefferson Smurfit Corp., expects its new mill will use 300,000 metric tpy of wastepaper. Mill sites are being evaluated by state economic development agencies, the company stated. These plans would take precedence over Smurfit's tentative proposal to expand newsprint production at its Newberg, Ore., mill by 275,000 tpy. The company's Newberg and Oregon City, Ore., mills have a combined recycled newsprint capacity of about 561,000 tpy, which makes Smurfit the largest producer in the U.S., followed by GSP.

With increasing political pressure and legislation to reduce solid waste and growing interest by publishers, virtually all North American newsprint producers are considering how to jump on the recycling bandwagon. While capacity for virgin newsprint is slated to suffer from oversupply over the next three years, a shortage of recycled newsprint is likely.

Companies that have stated publicly that they were studying how to incorporate secondary fiber in their newsprint operations include Abitibi-Price Inc., Bowater Inc., and Donohue Inc. Also, Fletcher Challenge Canada Ltd., Noranda Inc.,Kruger Inc., and Bear Island Paper Co. are considering deinking expansions, sources indicated. More announcements are expected soon. ■

U.S. recycled newsprint legislation.

State[1]	Consumption tax on virgin newsprint	Mandatory goal	Usage timetable[2]	Status
California	None	25%	1991	Pending
		50%	2000	
Connecticut	None	20%	1993	Passed
		90%	1998	
Florida	10¢/ton until 10/92 50¢/ton if goal not reached	50%	1992	Passed
Illinois	10¢/ton	10%	1992	Pending
		50%	1998	
New York	None	10%	1991[3]	Pending
Wisconsin	10% of list price per ton	10%	1991	Pending
		50%	1994	

1. Does not include preference purchasing provisions for state agencies. Includes only states where legislation is most advanced; Louisiana, Minnesota, Nebraska, Oregon, Pennsylvania, Rhode Island and Virginia are other states considering similar bills.
2. Applies to amount of total consumption that must be recycled-fiber based. Ranges imply goals to be phased in between these dates.
3. Also prohibits burning old newspapers.

Source: American Newspaper Publishers Assn.

1987 and 1988 wastepaper data (000 short tons).

	Consumption at U.S. paper and paperboard mills*	Exports	Total collected 1988
News	3,526.7	1,008.7	4,535.4
Corrugated	9,747.5	2,277.2	12,024.7
Mixed	2,180.2	884.8	3,065.0
High grades	4,615.0	1,469.4	6,084.4
Total	**20,069.4**	**5,640.1**	**25,709.5**

	Consumption at U.S. paper and paperboard mills*	Exports	Total collected 1987
News	3,442.5	870.2	4,312.7
Corrugated	9,176.7	1,921.7	11,098.4
Mixed	2,116.2	738.1	2,854.3
High grades	4,465.7	892.3	5,358.0
Total	**19,201.1**	**4,422.3**	**23,623.4**

*Includes consumption at plants making molded pulp and insulation products.

Source: American Paper Institute.

WORLD PAPER PRODUCTION HITS RECORD LEVEL FOR SIXTH YEAR IN A ROW

But indications of a continuing slowdown of the rate of growth in demand in several sectors raise the question, Is the party over?

By PETER SUTTON, JOHN PEARSON, and HUGH O'BRIAN, International Editors

Yet another year of record output by the world's pulp, paper, and board producers, 1988 was the sixth in a row. However, sad signs indicate that the industry's longest boom period may be drawing to an end. While output and consumption are likely to carry on upward, they'll be moving up more slowly than in the past six years. This, in addition to new production capacity, may mean that some papermakers will get hurt.

The world made 226,357,000 tons of paper and paperboard in 1988, 5% more than the previous year. World pulp production has also followed the same six-year record-breaking path. Output was 160,551,000 tons in 1988, a rise of nearly 4%. So pulp provided about 70% of the papermaking furnish, the lowest proportion since 1983, when it was 75%; in fact, it's been declining by about one percentage point each year—the effect of increasing use of secondary fibers and fillers.

Apparent consumption of paper and board totaled 224,056,000 tons last year, up by 4.5% from 1987 and continuing its record run. The world's per capita consumption increased marginally to 43.8 kg (93.4 lb), up from 43 kg (94.6 lb) in 1987 and the highest level in the last 20 years.

The level of trade stayed about the same; a little more than one ton of paper in every five crosses a frontier. For pulp, about 17% of output was traded internationally. The world's export and import figures almost balanced:

All figures in this review are in metric tons.

World's top 20 producing and consuming countries

PAPER AND BOARD PRODUCTION
(000 metric tons)

	1988	% change 1988/87
1. U.S.	69,477	+2.9
2. Japan	24,624	+9.3
3. Canada	16,638	+3.7
4. People's Rep. China	12,645	+10.8
5. U.S.S.R.	10,750	+1.7
6. Fed. Rep. Germany	10,576	+6.4
7. Finland	8,653	+8.0
8. Sweden	8,161	+4.2
9. France	6,313	+8.2
10. Italy	5,370	+7.7
11. Brazil	4,639	−1.5
12. U.K.	4,295	+2.7
13. Rep. Korea	3,659	+15.7
14. Spain	3,429	+5.4
15. Taiwan	2,949	+7.7
16. Austria	2,650	+12.4
17. Mexico	2,593	+0.7
18. Netherlands	2,462	+13.6
19. India	1,915	+1.5
20. Australia	1,854	+10.5

PULP PRODUCTION
(000 metric tons)

	1988	% change 1988/87
1. U.S.	55,530	+2.8
2. Canada	23,679	+2.9
3. Japan	10,415	+7.0
4. Sweden	10,307	+3.3
5. U.S.S.R.	10,065	+0.9
6. Finland	9,001	+6.4
7. People's Rep. China	8,350	+12.8
8. Brazil	4,296	+3.8
9. Fed. Rep. Germany	2,358	+4.4
10. France	2,190	+4.7
11. Norway	1,917	+1.5
12. South Africa	1,885	+2.4
13. Spain	1,665	+4.2
14. Portugal	1,472	+4.5
15. Austria	1,455	+9.2
16. New Zealand	1,212	+9.4
17. Czechoslovakia	1,121	+2.8
18. Australia	1,051	+9.0
19. India	1,050	+0.0
20. Poland	921	+ 1.7

PER CAPITA CONSUMPTION
(lb/year)

	1988	% change 1988/87
1. U.S.	699	+9.2
2. Sweden	685	+30.7
3. Canada	543	+15.8
4. Switzerland	459	+10.3
5. Japan	450	+18.1
6. Finland	449	+1.1
7. Fed. Rep. Germany	448	+10.1
8. Denmark	444	+10.2
9. Belgium	430	+15.0
10. Netherlands	428	−12.3
11. U.K.	360	+15.4
12. New Zealand	345	+2.0
13. Australia	342	+8.6
14. Taiwan	337	+18.7
15. Norway	333	+6.7
16. Hong Kong	323	−0.9
17. Austria	318	+14.0
18. France	313	+13.8
19. Italy	238	+15.0
20. Iceland	230	−5.7

a gap of just 2.3 million tons for paper and board and of 1.2 million tons for pulp.

RECORD-BUSTERS VI. Europe, North America, and Asia all set new production records. And as they make 94% of the world's paper and board, they're the real record busters. Europe's total of 75.2 million tons was up nearly 5% from 1987. New records were set by Fed. Rep. Germany, which crossed the 10-million-ton mark, and Italy, which made more than 5 million tons for the first time. Other firsts included France, which made more than 6 million tons, and Sweden, which made more than 8 million tons. The three Nordic nations together made 18.5 million tons of paper and board, an incredible 25% of the continent's total, and exported 14.9 million tons of the stuff.

Asia crashed through the 50-million-ton barrier in 1988. Asia and Australasia's 29 papermakers made 52 million tons, up a staggering 15%. Japan made almost half of this total, raising its output by 2 million tons in just one year—though it saw imports rise too. People's Rep. China, Rep. Korea, and Taiwan all reached new record levels. These four nations made 84% of the continent's total, but special mention should be made of Indonesia, where output is growing fast—close to 1 million tons in 1988.

THE BIG AMERICANS. The U.S. secured the world's record output by making 69 million tons of paper, up nearly 3% and backed up by record exports and earnings. Prospects for 1989 are fair, but the rate of growth in consumption will probably be slower. Canada's mills ran almost flat out for the second year in a row, making more paper than ever before and exporting nearly 70% of it as well as shipping 7.2 million tons of market pulp abroad.

NOT SO HOT. The two regions that, in terms of output, did not put in the strongest of performances were South America and Africa. The former made slightly more paper and board in 1988 than it did in 1987. This was largely because output in Brazil and Argentina dropped, while in Mexico and Chile, it was almost static. The continent's pulp mills performed better, raising output by 4% to top 7 million tons.

Africa's papermakers, with the exception of South Africa, which wants to keep its output secret, are still having difficulty raising output. Once again, many of Africa's figures must be estimated, but the total 2.48 million tons of paper output effectively means it's about the same as it was in 1986. One nation worth mentioning is Zimbabwe, which is working hard to develop its paper industry.

END OF THE PARTY? Production figures are a reflection of the market, and there's no doubt that the world's market overall was good once again in 1988. But unmistakeable signs of a slowdown in the rate of growth in demand appeared in several major sectors as 1988 progressed. These signs have become stronger in 1989 and lead to the conclusion that the papermakers' party may be coming to an end.

These signs come mostly from the sharp end, the market: the six-month struggle to raise newsprint and kraft liner prices in the U.S., the stickiness of these same sectors in Europe, the leap in newsprint production capacity coming onstream in Europe and America, the gloomier reports from several sectors of Europe's massive printing/writing market, the increasing self-sufficiency of Asian countries (good for them, but not for importers), and the general drop in the rate of demand growth in several major countries.

These and other signs indicate a climb-down from the euphoric heights of recent years, but they may not mean a deep depression; 1989 could still be the seventh year of record production in a row. The party may be over, but hopefully it's back to normality with a slight headache rather than sinking into a deep sleep. ■

Africa

Paper and board output by African nations is estimated at 2.5 million tons in 1988, roughly the same as in 1987. Pulp production was also a static 2.5 million tons.

South Africa is the colossus of Africa's paper industry. Unfortunately, the country no longer publishes its pulp and paper output statistics, but we estimate that it accounts for two-thirds of all of the paper that is produced in Africa and three-quarters of all of the pulp produced. In addition, South Africa also consumes approximately 40% of all of the paper and board used in the continent.

Despite its political isolation, South Africa continues to be a potent force in world export markets. Its paper industry benefits from several key advantages, among which are its fairly high per capita consumption (by African standards); its raw materials resource base; its good geographical position, which makes exporting to the Pacific Rim and elsewhere comparatively easy; and its simple industry structure, which has two giant companies—Sappi Ltd. and Mondi Paper Co. Ltd.—dominating most of the pulp and paperproduction in the country.

Further rationalization of that industry structure is now under way, with Sappi agreeing to take over the pulp interests of U.K. group Courtaulds. These amount

Review of top 20 nations in pulp/paper production

Australia

Population: 16,358,000. Per capita consumption of paper and board: 113 kg/249 lb. Paper and board mills: 18. Pulp mills: 19 (sulfate: 2, sulfite: 1; semichemical: 5; mechanical: 8; nonwood: 1).

Paper/board capacity: 2,050,000e tons **Pulp capacity:** 1,100,000e tons
Operating rate 1988: 90 %

	Production		Imports		Exports	
	1987	**1988**	**1987**	**1988**	**1987**	**1988**
Paper	1,233	1,265	513	—	10	—
Board	445	589	—	—	—	—
Total	**1,678**	**1,854**	**800e**	**800e**	**105e**	**110e**
Chemical woodpulp	585	464	279	280e	70	70e
Mechanicals, other pulps	379	588	1	0	0	0
Total	**964**	**1,051**	**280**	**280e**	**70**	**70e**

Austria

Population: 7,493,000. Per capita consumption of paper and board: 143 kg/315 lb. Paper and board mills: 33. Pulp mills: 14 (sulfate: 3; sulfite: 6; semichemical: 1; mechanical: 4).

Paper/board capacity: 3,001,000 tons **Pulp capacity:** 1,686,000 tons
Operating rate 1988: 88 % **Operating rate 1988:** 86 %

	Production		Imports		Exports	
	1987	**1988**	**1987**	**1988**	**1987**	**1988**
Paper	1,989	2,259	338	347	1,449	1,692
Board	368	391	24	70	269	292
Total	**2,357**	**2,650**	**362**	**417**	**1,718**	**1,984**
Chemical woodpulp	1,014	1,045	339	324	281	260
Mechanicals, other pulps	319	410	18	24	1	2
Total	**1,333**	**1,455**	**357**	**348**	**282**	**262**
Market pulp	363	363	357	348	282	262

Brazil

Population: 144,427,000. Per capita consumption of paper and board: 26 kg/57 lb. Paper and board mills: 146. Pulp mills: 38.

Paper/board capacity: 16 tons **Pulp capacity:** 3 tons
Operating rate 1988: 6 % **Operating rate 1988:** 4 %

	Production		Imports		Exports	
	1987	**1988**	**1987**	**1988**	**1987**	**1988**
Paper		5,446,000	3,523,000	85	95	4,188
Board	4,205	265	188	593	956	524
Total	**434**	**3**	**3**	**16**	**49**	**4,712**
Chemical woodpulp	4,639	268	191	609	1,005	3,591
Mechanicals, other pulps	3,709	44	55	807	1,053	546
Total	**587**	**1**	**3**	**9**	**11**	**4,137**
Market pulp	4,296	45	58	816	1,064	1,854

Canada

Population: 26,093,000. Per capita consumption of paper and board: 236 kg/520 lb. Paper and board mills: 109. Pulp mills: 36.

Paper/board capacity: 17,028 tons **Pulp capacity:** 25,021 tons
Operating rate 1988: 98 % **Operating rate 1988:** 95 %

	Production		Imports		Exports	
	1987	**1988**	**1987**	**1988**	**1987**	**1988**
Paper	15,303	15,915	529	627	11,073	11,352
Board	742	723	229	324	80	68
Total	**16,045**	**16,638**	**700**	**951**	**11,153**	**11,420**
Chemical woodpulp	12,957	13,013	160	156	7,466	7,486
Mechanicals, other pulps	10,056	10,666	38	24	769	903
Total	**23,013**	**23,679**	**198**	**180**	**8,235**	**8,389**
Market pulp	8,011	8,227	NA	NA	7,090	7,210

China, People's Rep. of

Population: 1,096,140,000. Per capita consumption of paper and board: 12 kg/27 lb. Paper and board mills: 5,000e. Pulp mills: 9,000.

Paper/board capacity: 13,000,000 tons **Pulp capacity:** 9,000,000e tons

	Production		Imports		Exports	
	1987	**1988**	**1987**	**1988**	**1987**	**1988**
Newsprint	365	334	142	102	20	7
Packaging paper/board	5,236e	5,720e	1,101	651	110	155
Other paper/board	5,810e	6,591e	93	99	190	106
Total	**11,411e**	**12,645e**	**1,336**	**852**	**320**	**268**
Chemical woodpulp	1,109	1,198	657	746	5	8
Mechanicals, other pulps	5,381e	6,214e	26	49	0	6
Reed and bagasse	910	938	—	—	—	—
Total	**7,400e**	**8,350e**	**683**	**795**	**5**	**14**

Finland

Population: 4,947,000. Per capita consumption of paper and board: 204 kg/449 lb. Paper and board mills: 46. Pulp mills: 47 (sulfate: 18; sulfite: 3; semichemical: 3; mechanical: 23).

Paper/board capacity: 9,095,000 tons **Pulp capacity:** 9,545,000 tons
Operating rate 1988: 95 % **Operating rate 1988:** 94 %

	Production		Imports		Exports	
	1987	**1988**	**1987**	**1988**	**1987**	**1988**
Paper	6,913	7,411	64	74	5,837	6,170
Board	1,099	1,242	21	30	900	1,015
Total	**8,012**	**8,653**	**85**	**104**	**6,737**	**7,185**
Chemical woodpulp	5,271	5,610	52	27	1,478	1,491
Mechanicals, other pulps	3,190	3,391	40	46	163	190
Total	**8,461**	**9,001**	**92**	**73**	**1,641**	**1,681**
Market pulp	2,027	2,108	92	73	1,641	1,681

France

Population: 55,789,000. Per capita consumption of paper and board: 142 kg/313 lb. Paper and board mills: 146. Pulp mills: 21 (sulfate: 7; sulfite: 2; semichemical: 1; mechanical: 10; nonwood: 1).

Paper/board capacity: 6,550,000 tons **Pulp capacity:** 2,475,000 tons
Operating rate 1988: 96.4 % **Operating rate 1988:** 88.5 %

	Production		Imports		Exports	
	1987	**1988**	**1987**	**1988**	**1987**	**1988**
Paper	5,277	5,707	2,406	2,921	1,454	1,676
Board	555	606	633	570	155	194
Total	**5,832**	**6,313**	**3,039**	**3,491**	**1,609**	**1,870**
Chemical woodpulp	2,561	1,655	1,633	1,689	398	405
Mechanicals, other pulps	469	535	132	56	6	0
Total	**2,092**	**2,190**	**1,765**	**1,745**	**404**	**405**
Market pulp	718	754	1,765	1,745	404	405

Germany, Fed. Rep.

Population: 60,714,000. Per capita consumption of paper and board: 201 kg/442 lb. Paper and board mills: 174. Pulp mills: 35 (sulfite: 8; semichemical: 1; mechanical: 24).

Paper/board capacity: 11,397,000 tons **Pulp capacity:** 2,414,000 tons
Operating rate 1988: 94 % **Operating rate 1988:** 98 %

	Production		Imports[1]		Exports	
	1987	**1988**	**1987**	**1988**	**1987**	**1988**
Paper	8,962	9,527	—	5,103	—	3,481
Board	975	1,049	—	468	—	299
Total	**9,937**	**10,576**	**5,134**	**5,571**	**3,384**	**3,780**

[1] Because Fed. Rep. Germany has changed to the Harmonized System, comparison of imports/exports 1987 levels is not possible.

	Production		Imports		Exports	
	1987	**1988**	**1987**	**1988**	**1987**	**1988**
Chemical woodpulp	826	850	3,134	3,235	140	190
Mechanicals, other pulps	1,433	1,508	66	98	—	12
Total	**2,259**	**2,358**	**3,200**	**3,333**	**140**	**202**
Market pulp	282	279	3,200	3,333	140	202

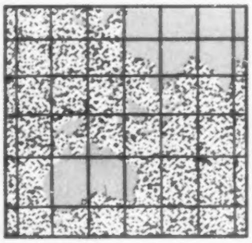
to a 75% share of the massive 450,000-tpy Saiccor Ltd. dissolving pulp mill plus a 50% holding in the highly successful Usutu Pulp Co. in the neighboring country of Swaziland, which has a capacity of 180,000 tpy of unbleached kraft pulp. The latter deal is awaiting approval from the King of Swaziland. The agreement with Courtaulds reinforces Sappi's position as the biggest pulp and paper producer in South Africa. On completion, its capacity will amount to 1.5 million tpy of pulp and 840,000 tpy of paper and board. It will also be one of the leading suppliers in the world of unbleached pulp grades.

Mondi has also started on a major investment program. This year it is rebuilding No. 6 cartonboard paper machine at its Springs mill near Johannesburg, doubling capacity to 81,000 tpy and allowing for further expansion at a later stage. But in addition, it is planning to raise paper capacity at its different mills by a total of 130,000 tpy. Half of the investment of $160 million will go toward the Merebank mill in Durban, where supercalendered paper output will be raised by 45% to 127,000 tpy by a rebuild of No. 1 paper machine. Work will be completed by early 1990. Capacity at the Richards Bay eucalyptus pulp mill will also be boosted to 420,000 tpy.

Elsewhere in Africa, the picture is less encouraging, with rising raw materials costs and shortages of funds for the purchase of spare parts inhibiting industry development. However, some bright spots exist. Zimbabwe's pulp and paper industry ran at full capacity in 1988, and slow and careful expansion of the industry now seems likely. Plans include a new 60,000-tpy kraft pulp line and fine paper machine and expansion at Hunyani Pulp & Paper Industries Ltd., which is the nation's biggest papermaker. Tanzania's industry, although not operating at anything close to capacity, has begun exporting printing/writing and casemaking materials.

Morocco also continues to shine, with Cellulose du Maroc's 100,000-tpy eucalyptus pulp mill operating at full capacity in 1988 and through first-half 1989. There are long-term prospects that a eucalyptus pulp mill could be built in the Congo. Current expansions are already providing pulpwood to some key European mills.

Overall, however, the outlook is bleak for African producers. Rising interest rates can be expected to restrict further the availability of dollars to import raw materials for pulp and papermaking or to expand output. And domestic consumption levels are also limited by the failing economies of most of the African nations. ■



Asia/Australasia

Output of paper and board in Asia/Australasia climbed by 9.5% to 52.0 million tons in 1988. It was the first time the continent had broken through the 50-million-ton mark and is a milestone in the development of the region's paper industry. Pulp production also rose strongly by 9%, soaring to 30.4 million tons. Again, a magic number—30 million tons—was crossed for the first time.

Last year was a good one for the major producers: Japan, People's Rep. China, Rep. Korea, and Taiwan. But it was also a year in which growing attention was focused on the rising stars of the continent: Indonesia, Thailand, and Turkey. To the south, the Australasian pulp and paper industries of New Zealand and Australia continued a phase of expansion and internationalization.

The leading paper and board producer of the continent is Japan, which is also the world's second-largest producer. In 1988, its paper and board output soared ahead by 9.3% from 1987 to 24.6 million tons. Most of the increase was fueled by a booming domestic economy, with GNP racing ahead by 5.7%. Commercial printing and advertising led the way in boosting the markets for paper, especially coated grades.

With the value of the yen continuing high against other currencies, Japanese imports might have been expected to rise sharply. To some extent they did because imports passed 1 million tons for the first time, rising by 20.6%. But even so, they still account for only 4% of total Japanese consumption. The yen's high value also effected exports, which tumbled by 22% to 636,000 tons.

A new investment wave swept the Japanese industry in 1988 in response to rising profits. Estimates show that $3.464 million was invested in 1988, a rise of 44% from 1987, and that 57% of the investment is designed to increase capacity, mainly in wood-free paper, all types of coated paper, and newsprint. A large amount of offshore investment is also taking place, with North America a key target for investment yen but with interest growing in Australasia and Europe. In looking for offshore opportunities, Japanese producers are aiming to make use of their burgeoning profits to guarantee their fiber needs for the future, and—anticipating a continuing high value for the yen—to supply the country's import requirements for the future.

People's Rep. China continued its relentless climb up the ladder of the world's leading papermakers in 1988, producing more than 12.6 million tons of paper and board, an increase of nearly 11% from 1987. In just two years (1986-88) its output has grown by more than 25%,

Top 20 producing nations

India

Population: 818,782,000. Per capita consumption of paper and board: 3e kg/6e lb. Paper and board mills: 300. Pulp mills: 1

Paper/board capacity: 2,760,000 tons

	Production		Imports		Exports	
	1987	1988	1987	1988	1987	1988
Paper	1,136	1,165e	300	300	—	—
Board	750	750e	0	0	—	—
Total	**1,886**	**1,915e**	**300**	**300e**	**—**	**—**
Total pulp	**1,050**	**1,050e**	**300**	**300e**	**—**	**—**
Market pulp	15	30e	300	300e	—	—

Italy

Population: 57,265,000. Per capita consumption of paper and board: 108 kg/238 lb. Paper and board mills: 340. Pulp mills: 21 (sulfite: 2; semichemical: 3; mechanical: 15; nonwood: 1)

Paper/board capacity: 5,800,000 tons
Operating rate 1988: 93 %

Pulp capacity: 1,080,000 tons
Operating rate 1988: 73 %

	Production		Imports		Exports	
	1987	1988	1987	1988	1987	1988
Paper	4,033	4,339	1,920	1,941	949	1,033
Board	954	1,031	204	208	214	276
Total	**4,987**	**5,370**	**2,124**	**2,149**	**1,163**	**1,309**
Chemical woodpulp	218	230	1,938	2,017	36	48
Mechanicals, other pulps	519	559	147	130	8	8
Total	**737**	**789**	**2,085**	**2,147**	**44**	**56**
Market pulp	250	270	2,085	2,147	44	56

Japan

Population: 122,424,000. Per capita consumption of paper and board: 204 kg/449 lb. Paper and board mills: 489. Pulp mills: 60 (sulfate: 37; sulfite: 4; semichemical: 8; mechanical: 27; nonwood: 3)

Paper/board capacity: 27,143,000 tons
Operating rate 1988: 90.7 %

Pulp capacity: 13,176,000 tons
Operating rate 1988: 69.6 %

	Production		Imports		Exports	
	1987	1988	1987	1988	1987	1988
Paper	19,537	21,446	825	914	608	491
Board	3,000	3,178	43	133	206	145
Total	**22,537**	**24,624**	**868**	**1,047**	**814**	**636**
Chemical woodpulp	7,607	8,055	2,031	2,331	16	13
Mechanicals, other pulps	2,126	2,360	700	759	0	0
Total	**9,733**	**10,415**	**2,731**	**3,090**	**16**	**13**
Market pulp	956	917	2,731	3,090	16	13

Korea, Rep. of

Population: 42,621,000. Per capita consumption of paper and board: 82 kg/181 lb. Paper and board mills: 150e. Pulp mills: 5 (sulfate: 1, mechanical: 4)

Paper/board capacity: 4,674,000 tons
Operating rate 1988: 89 %

Pulp capacity: 390,000 tons
Operating rate 1988: 80 %

	Production		Imports		Exports	
	1987	1988	1987	1988	1987	1988
Paper	2,507	2,907	150	172	116	139
Board	656	752	6	4	282	212
Total	**3,163**	**3,659**	**156**	**176**	**398**	**351**
Chemical woodpulp	147	155	739	823	0	0
Mechanicals, other pulps	168	158	60	82	0	0
Total	**315**	**313**	**799**	**905**	**0**	**0**
Market pulp	147	155	799	905	0	0

Mexico

Population: 84,884,000. Per capita consumption of paper and board: 30 kg/65 lb. Paper and board mills: 67. Pulp mills: 15 (sulfate: 8; mechanical: 2; nonwood: 5)

Paper/board capacity: 3,375,000 tons
Operating rate 1988: 77 %

Pulp capacity: 1,060,000 tons
Operating rate 1988: 76 %

	Production		Imports		Exports	
	1987	1988	1987	1988	1987	1988
Paper	2,229	2,323	61	128	243	252
Board	276	270	5	15	0	1
Total	**2,575**	**2,593**	**66**	**143**	**243**	**253**
Chemical woodpulp	439	433	454	310	20	49
Bleached bagasse/straw	227	247	0	0	0	0
Mechanicals, other pulps	134	129	25	43	0	4
Total	**800**	**809**	**479**	**353**	**20**	**53**

Netherlands

Population: 14,758,000. Per capita consumption of paper and board: 195 kg/428 lb. Paper and board mills: 32. Pulp mills: 3 (mechanical: 2, nonwood: 1).

Paper/board capacity: 2,575,000 tons
Operating rate 1988: 96 %

Pulp capacity: 198,000 tons
Operating rate 1988: 93 %

	Production		Imports		Exports	
	1987	1988	1987	1988	1987	1988
Paper	1,495	1,720	1,580	1,695	1,028	1,221
Board	673	742	338	399	411	462
Total	**2,168**	**2,462**	**1,918**	**2,094**	**1,439**	**1,683**
Chemical woodpulp	0	0	561	598	31	22
Mechanicals, other pulps	135	184	26	23	3	4
Total	**135**	**184**	**587**	**621**	**34**	**26**

Spain

Population: 39,053,000. Per capita consumption of paper and board: 99 kg/217 lb. Paper and board mills: 161. Pulp mills: 26 (sulfate: 24; sulfite: 1; mechanical: 5; nonwood: 3)

Paper/board capacity: 3,650,000 tons
Operating rate 1988: 95 %

Pulp capacity: 174,000 tons
Operating rate 1988: 96 %

	Production		Imports		Exports	
	1987	1988	1987	1988	1987	1988
Paper	2,895	3,060	689	913	358	367
Board	357	369	54	14	103	71
Total	**3,252**	**3,429**	**743**	**927**	**461**	**438**
Chemical woodpulp	1,379	1,445	420	410	505	536
Mechanicals, other pulps	219	220	9	12	7	11
Total	**1,598**	**1,665**	**429**	**422**	**512**	**547**
Market pulp	803	801	429	422	512	547

Sweden

Population: 8,346,000. Per capita consumption of paper and board: 242 kg/532 lb. Paper and board mills: 55. Pulp mills: 55 (sulfate: 25; sulfite: 7; semichemical: 2; mechanical: 21).

Paper/board capacity: 8,630,000 tons
Operating rate 1988: 95 %

Pulp capacity: 10,870,000 tons
Operating rate 1988: 95 %

	Production		Imports		Exports	
	1987	1988	1987	1988	1987	1988
Paper	6,584	6,882	203	196	5,084	5,356
Board	1,250	1,279	85	79	1,012	1,021
Total	**7,834**	**8,161**	**288**	**275**	**6,096**	**6,377**
Chemical woodpulp	7,001	7,155	119	103	2,416	2,463
Mechanicals, other pulps	2,972	3,152	25	32	619	728
Total	**9,973**	**10,307**	**144**	**135**	**3,035**	**3,191**
Market pulp	3,526	3,662	144	135	3,035	3,191

and it is now the fourth-biggest producer in the world. Per capita consumption, however, is a mere 12.1 kg (26 lb), and similar annual growth rates will have to be sustained if the country is to reach its target of a per capita consumption of 40 kg (88 lb) by the year 2000.

Although it is still soon after the event, it seems unlikely that the recent political and social unrest in the country will lead to a change in the government's economic policy. A continuing program of modernization of existing pulp and paper lines plus further investment in pulp mills can be expected. Among the most interesting projects now under consideration is a 250,000-tpy, joint-venture softwood pulp mill to be built with the U.S.S.R. in Heilongjiang, China. It would use larch pulpwood from Soviet Siberia.

The third-biggest paper producer of the region, Rep. Korea, had an important year in 1988. It played host to the Olympic Games, recorded yet another year of impressive economic growth (GNP rose by 12.2%), and successfully conducted the first fully democratic parliamentary elections in its history. Against this background, producers of printing/writing paper and newsprint fared particularly well. Newsprint, in particular, was in short supply. Coated duplex board also performed well, but for the linerboard industry it was a different story. Overcapacity along with an appreciation of the local currency (the won) against the dollar combined with a fall in demand from Hong Kong and People's Rep. China to dent profitability in this sector. Reductions in the tariffs paid by imports have also damaged this sector of the industry.

Taiwan's paper and board output was up by 7.8% to 2.95 million tons, a figure that is considered disappointing in view of the fast growth of previous years. Reasons for the slowdown were (as for Rep. Korea) some overcapacity, the appreciation of the local currency against the dollar, liberalization of trade, and an increase in imports. Without these factors, output would have crossed the 3-million-ton mark in 1988. A redeeming factor, however, was that exports rose to almost 250,000 tons.

Turning to the rising stars of the East, Indonesia's paper and board output rose by 12.7% in 1988 to 932,000 tons, and the million ton mark should be crossed this year. With its good growing conditions for pulpwood, reserves of mixed tropical hardwood, and favorable location in the Far East market, Indonesia is coming under scrutiny as an investment prospect for the world's pulp- and papermakers. Scott Paper Co. is among those considering new pulp mills, and predictions say that about 1 million tons of new pulp capacity could start up by the end of the century. Last year saw the startup of a new 7.1-m-wide kraft paper and kraft liner machine at domestic producer Kertas Kraft Aceh. It is designed to replace imports in the short term, but some export tonnage will be available in the future.

Also approaching 1 million tons of paper and board output is Turkey. Its output was cut to 715,000 tons by labor disputes last year, but potentially it could approach 850,000 tons in 1989. Several companies view Turkey as a prospect for expansion because of its low per capita consumption of 15 kg (33 lb) and its geographic position between Europe, the Middle East, and Asia.

Thailand is also becoming an attractive site for investment, and many reports are circulating of major pulp mill projects to be based on pulpwood plantations. Interest in the Philippines is also growing, with the largest company there, state-owned Picop, up for sale.

In Australasia, output of paper and board rose by 10% to nearly 2.6 million tons in 1988. There was continuing rationalization in New Zealand, with Australian brewing company Elders Resources winning control of New Zealand Forest Products Ltd. and subsequently announcing a major expansion of the Kinleith kraft liner and market pulp mill in New Zealand. Another New Zealand company, Carter Holt Harvey (CHH) acquired the country's major tissue producer, Caxton Paper Mills Ltd. CHH has also been active overseas in recent years, acquiring a share in Chilean market pulp producer Celulosa Arauco y Constitucion. New Zealand's largest company, Fletcher Challenge Ltd., also looked to Latin America in 1988, buying control of Brazilian newsprint producer Pisa. In Canada, Fletcher merged its Crown Forest Industries Ltd. and British Columbia Forest Products Ltd. subsidiaries under the name Fletcher Challenge Canada. In Australia, it acquired 50% of Australian Newsprint Mills Ltd. At its subsidiary, Tasman Pulp & Paper Co. Ltd. in New Zealand, Fletcher is currently increasing pulp capacity by 30,000 tpy and modernizing its three paper machines, adding an extra 45,000 tpy of newsprint.

Australia witnessed an influx of interest from foreign companies in 1988-89. APPM devised a plan with Noranda Forest Inc. of Canada for a 400,000-tpy pulp mill to be built in Wesley Vale, Tasmania. However, Noranda subsequently withdrew in the face of unacceptable and loosely worded environmental restrictions. Daishowa Paper Manufacturing Co. Ltd. of Japan has now resurrected that project, planning perhaps to make unbleached pulp in Tasmania and export the product for bleaching to Japan. Daishowa is also planning a $365-million mill for Australia. It would make 150,000 tpy of kraft liner for the Australian market and 150,000 tpy of eucalyptus market pulp. Australia's Amcor meanwhile is seeking acquisitions in the paper and packaging sector, with the U.S. and Europe the main target areas for expansion.

The Indian subcontinent is still the weak point in the Asian pulp- and papermaking world. With poor power and fiber supply and the absence of financial resources, India, Pakistan, and Bangladesh are not easily able to boost their output. Efforts are being concentrated on newsprint and printing papers, and in the case of India, some substantial progress has been made in the production of newsprint from a bagasse furnish. ■

World pulp, paper, and board industry at a glance

Country	Population (1,000)	Number of mills		Capacity (1,000 tons)		Per capita (lb)	Apparent consumption (1,000 tons)				Production (1,000 tons)			
		P&B	Pulp	P&B	Pulp		P&B		Pulp		P&B		Pulp	
							1987	1988	1987	1988	1987	1988	1987	1988
EUROPE														
Belgium	9,925	14	3	1,190	450	430	1,863	1,938	717	770	1,030	1,134	389	448
Denmark	5,119	6	3	344	102	444	982	1,034	135	133	323	343	81	95
France	55,789	146	21	6,550	2,475	313	7,262	7,934	3,453	3,530	5,832	6,313	2,092	2,190
Germany, Fed. Rep.	60,714	174	35	11,397	2,414	448	11,687	12,367	5,319	5,489	9,937	10,576	2,259	2,358
Greece	10,013	25	2	500	75	143	680	650	230	255	416	375	50	65
Ireland	3,650	1	0	40	0	186	305	309	0	0	30	34	0	0
Italy	57,265	340	21	5,800	1,080	238	5,948	6,210	2,778	2,880	4,987	5,370	737	789
Netherlands	14,758	32	3	2,575	198	428	2,647	2,873	668	779	2,168	2,462	135	184
Portugal	10,246	90	8	833	1,453	143	602	664	398	420	627	681	1,408	1,472
Spain	39,053	161	33	3,650	174	221	3,534	3,918	1,515	1,540	3,252	3,429	1,598	1,665
United Kingdom	56,799	92	7	4,676	466	360	8,734	9,285	2,325	2,501	4,183	4,295	389	421
EEC	**323,331**	**1,081**	**136**	**37,555**	**8,887**	**321**	**44,244**	**47,182**	**17,558**	**18,297**	**32,785**	**35,012**	**9,138**	**9,687**
Finland	4,947	46	47	9,095	9,545	699	1,360	1,572	6,912	7,393	8,012	8,653	8,461	9,001
Norway	4,200	19	23	1,900	2,150	333	569	635	1,382	1,359	1,590	1,670	1,889	1,917
Sweden	8,346	55	55	8,630	10,870	543	2,026	2,059	7,082	7,251	7,834	8,161	9,973	10,307
Nordic	**17,493**	**120**	**125**	**19,625**	**22,565**	**537**	**3,955**	**4,266**	**15,376**	**16,003**	**17,436**	**18,484**	**20,323**	**21,225**
Austria	7,493	33	14	3,001	1,686	318	1,001	1,083	1,408	1,541	2,357	2,650	1,333	1,455
Iceland	249	0	0	0	0	230	27	26	0	0	0	0	0	0
Malta	347	0	0	0	0	63	10	10	0	0	0	0	0	0
Switzerland	6,567	29	6	1,250	365	459	1,327	1,370	596	634	1,147	1,216	324	335
Other W. Europe	**14,656**	**62**	**20**	**4,251**	**2,051**	**374**	**2,365**	**2,489**	**2,004**	**2,175**	**3,504**	**3,866**	**1,657**	**1,790**
Total W. Europe	**355,480**	**1,263**	**281**	**61,431**	**33,503**	**334**	**50,564**	**53,937**	**34,938**	**36,475**	**53,725**	**57,362**	**31,118**	**32,702**
Albania	3,134	4	4	15e	15e	11	17	15	10	10	10	10	10	10
Bulgaria	8,995	15	9	520e	260e	108	440	440	271	270	350	350	220	220
Czechoslovakia	15,624	36	23	1,261	1,223	172	1,181	1,220	890	918	1,261	1,259	1,090	1,121
German Dem. Rep.	16,661	21	19	1,500e	750e	184	1,356	1,395	835	835	1,339	1,362	672	690
Hungary	10,600	10	4	550e	150e	143	668	688	272	292	522	535	69	81
Poland	37,960	47	20	1,560	1,057	83	1,391	1,431	1,090	1,110	1,375	1,444	906	921
Romania	23,048	20e	12e	850e	750e	70	728	730	660	660	768	770	610	610
USSR	283,682	173	54	11,494	11,000e	78	9,869	10,025	9,111	9,185	10,566	10,750	9,974	10,065
Yugoslavia	23,569	30	21	1,500	900	106	1,086	1,133	879	943	1,343	1,377	800	837
E. Europe	**423,273**	**356**	**166**	**19,250**	**16,105**	**89**	**16,736**	**17,077**	**14,018**	**14,223**	**17,534**	**17,857**	**14,351**	**14,555**
Total Europe	**778,753**	**1,619**	**447**	**80,681**	**49,608**	**201**	**67,300**	**71,014**	**48,956**	**50,698**	**71,259**	**75,219**	**45,469**	**47,257**
NORTH AMERICA														
Canada	26,093	109	36	17,028	25,021	520	5,592	6,169	14,976	15,470	16,045	16,638	23,013	23,679
United States	245,414	548	217	72,862	56,860	685	74,478	76,394	53,990	55,086	67,534	69,477	54,026	55,530
North America	**271,507**	**657**	**253**	**89,890**	**81,881**	[illegible]	**80,070**	**82,563**	**68,966**	**70,556**	**83,579**	**86,115**	**77,039**	**79,209**
ASIA														
Afghanistan	15,090	0	0	0	0	<1	2	3	0	0	0	0	0	0
Bahrain	481	0	0	0	0	28	6	6	−0	0	0	0	0	0
Bangladesh	109,579	8	9	127	126	2	117	125	99	99	115	122	83	76
Bhutan	1,451	0	0	0	0	2	1	1	0	0	0	0	0	0
Brunei	249	0	0	0	0	26	3	3	0	0	0	0	0	0
Burma	39,966	3	2	31	30	3	47	47	27	27	27	27	29	29
China, Peo. Rep.[1]	1,096,140	200	50e	13,000e	9,000e	27	12,427	13,229	8,078	9,131	11,411	12,645	7,400	8,350
Cyprus	687	1	0	10e	0	119	37	37	1	1	2	2	0	0
Hong Kong	5,692	2	0	85e	0	323	810	837	0	0	10	17	0	0
India	818,782	300	100e	2,760	1,450e	5	2,075	1,915	1,350	1,350	1,886	1,915	1,050	1,050
Indonesia	174,951	40	17e	1,162	747	10	783	829	575	658	827	932	350	467
Iran	53,126	6	2	315	188	18	422	426	75	77	105	142	60	65
Iraq	17,656	0	0	0	0	9	65	68	39	76	25	28	14	18
Israel	4,442	5	0	186	0	228	414	461	66	67	164	179	0	0
Japan	122,424	489	60	27,143	13,176	450	22,591	25,035	12,448	13,492	22,537	24,624	9,733	10,415
Jordan	3,943	3	0	180	0	37	67	67	5	4	14	10	0	0
Kampuchea	7,869	0	0	0	0	1	2	2	0	0	0	0	0	0
Korea, Peo. Rep.	21,902	0	0	0	0	8	80	80	70	70	80	80	60	60
Korea, Rep. of	42,621	150e	5	4,674	390	180	2,921	3,484	1,114	1,218	3,163	3,659	315	313
Kuwait	1,938	1	0	25	0	103	91	91	10	10	23	23	0	0
Laos	3,874	0	0	0	0	1	1	1	0	0	0	0	0	0
Lebanon	2,827	3	0	50e	0	35	75	45	5	5	15	15	0	0
Macao	443	0	0	0	0	20	4	4	0	0	0	0	0	0
Malaysia	16,573	14	1	220	92	73	502	547	27	27	82	204	0	0
Mongolia	2,092	1	1	10e	6e	21	20	20	5	5	5	5	5	5
Nepal	18,033	2	2	8	8	3	20	21	0	0	4	7	0	0
Oman	1,377	0	0	0	0	10	6	6	0	0	0	0	0	0
Pakistan	114,939	15	3	160e	100e	6	344	288	116	111	98	101	75	70
Philippines	59,456	27	3	506	195	20	509	534	198	163	308	341	146	113
Qatar	340	0	0	0	0	65	10	10	0	0	0	0	0	0
Saudi Arabia	13,070	0	0	0	0	17	100	100	0	0	0	0	0	0
Singapore	2,645	2	0	31	0	183	0	220	6	6	0	10	0	0
Sri Lanka	16,779	2	2	27	26	4	27	27	15	15	27	27	6	6
Syria	11,638	13	14	8e	6e	15	80	80	5	5	5	5	5	5
Taiwan	19,900	0	3	3,250e	500e	337	2,880	3,045	713	765	2,737	2,949	416	425
Thailand	54,124	33	5	724	150e	33	825	825	210	230	610	610	150	170
Turkey	53,536	35	14	964	726	34	850	818	540	492	816	715	450	352
United Arab Emirates	1,501	0	0	0	0	110	73	75	0	0	0	0	0	0
Vietnam	64,227	30e	1	120e	60e	2	66	66	55	60	60	60	25	30
Yemen Arab Rep.	7,534	0	0	0	0	1	2	2	0	0	0	0	0	0
Yemen Dem. Rep.	2,339	0	0	0	0	2	2	2	0	0	0	0	0	0
Asia	**3,006,236**	**1,385**	**294**	**55,776**	**26,976**	**39**	**49,357**	**53,482**	**25,852**	**28,164**	**45,156**	**49,454**	**20,372**	**22,019**

1. Peo. Rep. China has an approximate total of 5,000 paper mills and 9,000 pulp mills. Only the largest 250 are included here.

Country	Population (1,000)	Number of mills		Capacity (1,000 tons)		Per capita (lb)	Apparent consumption (1,000 tons)				Production (1,000 tons)			
		P&B	Pulp	P&B	Pulp		P&B		Pulp		P&B		Pulp	
							1987	1988	1987	1988	1987	1988	1987	1988
LATIN AMERICA														
Argentina	31,536	100	25	1,300	880	70	1,140	1,000	708	700	1,064	1,001	725	727
Bahamas	253	0	0	0	0	130	15	15	0	0	0	0	0	0
Barbados	257	0	0	0	0	60	7	7	0	0	0	0	0	0
Belize	174	0	0	0	0	38	3	3	0	0	0	0	0	0
Bolivia	6,918	1	0	2e	0	7	21	21	0	0	1	1	0	0
Brazil	144,427	146	38	5,446	4,523	58	4,371	3,825	3,366	3,290	4,712	4,639	4,137	4,296
Chile	12,748	7	7	423	900e	61	350	352	338	381	442	450	861	910
Colombia	30,566	24	5	563	266	42	573	587	293	290	488	504	247	247
Costa Rica	2,866	2	1	18	25	92	122	120	7	7	12	12	6	6
Cuba	10,154	9	3	155e	60e	70	322	321	105	110	149	150	52	55
Dominican Rep.	6,867	2	0	15e	0	21	65	65	4	4	9	9	0	0
Ecuador	10,203	5	2	65	35	21	97	97	17	17	67	67	6	6
El Salvador	5,026	3	0	50e	0	29	67	67	12	12	29	29	0	0
Guatemala	8,680	4	0	60	0	22	72	86	9	9	34	40	0	0
Guyana	1,006	0	0	0	0	15	7	7	0	0	0	0	0	0
Haiti	6,263	0	0	0	0	2	6	6	0	0	0	0	0	0
Honduras	4,830	0	0	0	0	13	29	29	0	0	0	0	0	0
Jamaica	2,446	1	0	15	0	39	43	43	1	1	13	13	0	0
Mexico	84,884	87	15	3,375	1,060	64	2,398	2,483	1,259	1,109	2,575	2,593	800	809
Neth. Antilles	188	0	0	0	0	35	3	3	0	0	0	0	0	0
Nicaragua	3,622	0	0	0	0	5	8	8	0	0	0	0	0	0
Panama	2,322	3	0	30e	0	79	83	83	1	1	28	28	0	0
Paraguay	4,040	3	0	25e	0	14	26	26	0	0	13	13	0	0
Peru	21,254	17	3	405	270	31	235	303	144	151	148	218	90	92
Surinam	392	0	0	0	0	22	9	4	0	0	0	0	0	0
Trinidad/Tobago	1,243	0	0	0	0	58	48	33	2	2	0	0	0	0
Uruguay	3,081	5	2	83	27	49	64	69	36	33	58	66	27	26
Venezuela	18,756	12	3	785	184	108	811	922	395	372	654	708	101	103
Latin America	**425,002**	**411**	**104**	**12,815**	**8,230**	**56**	**10,995**	**10,585**	**6,697**	**6,489**	**10,496**	**10,541**	**7,052**	**7,277**
AUSTRALASIA														
Australia	16,358	18	19	2,050e	1,100e	342	2,373	2,544	1,174	1,051	1,678	1,854	964	1,051
Fiji	700	0	0	0	0	41	12	13	0	0	0	0	0	0
New Zealand	3,356	6	7	822	1,463	345	533	527	591	653	644	701	1,108	1,212
Papua New Guinea	3,804	0	0	0	0	4	6	6	0	0	0	0	0	0
Samoa	204	0	0	0	0	32	3	3	0	0	0	0	0	0
Australasia	**24,422**	**24**	**26**	**2,872**	**2,563**	**279**	**2,927**	**3,093**	**1,765**	**1,704**	**2,322**	**2,555**	**2,072**	**2,263**
AFRICA														
Algeria	23,841	6	3	160e	170e	17	180	180	95	95	110	110	35	35
Angola	9,481	2	1	30e	45e	4	19	19	15	15	15	15	15	15
Benin	4,448	0	0	0	0	2	4	4	0	0	0	0	0	0
Botswana	1,198	0	0	0	0	2	1	1	0	0	0	0	0	0
Burkina Faso	8,529	0	0	0	0	<1	1	1	0	0	0	0	0	0
Burundi	5,147	0	0	0	0	2	4	4	0	0	0	0	0	0
Cameroon	10,674	0	0	0	0	2	10	10	0	0	0	0	0	0
Central African Rep	2,771	0	0	0	0	1	1	1	0	0	0	0	0	0
Chad	5,401	0	0	0	0	<1	1	1	0	0	0	0	0	0
Congo	1,888	0	0	0	0	1	1	1	0	0	0	0	0	0
Egypt	51,453	16	3	180e	60e	24	550	560	100	100	160	160	70	70
Ethiopia	44,727	1	0	15e	0	1	21	21	4	4	11	11	0	0
Gabon	1,094	0	0	0	0	4	2	2	0	0	0	0	0	0
Gambia	812	0	0	0	0	6	2	2	0	0	0	0	0	0
Ghana	14,130	0	0	0	0	1	9	9	0	0	0	0	0	0
Guinea	6,540	0	0	0	0	1	4	4	0	0	0	0	0	0
Ivory Coast	11,612	0	0	0	0	15	77	80	0	0	0	0	0	0
Kenya	23,100	5	6	103	100	11	119	119	100	100	106	106	96	96
Lesotho	1,676	0	0	0	0	1	1	1	0	0	0	0	0	0
Liberia	2,396	0	0	0	0	1	1	1	0	0	0	0	0	0
Libya	4,232	10	0	10e	0	7	14	14	6	6	6	6	0	0
Madagascar	11,238	2	2	28	6	2	8	8	7	7	8	8	4	4
Malawi	7,884	0	0	0	0	3	12	12	0	0	0	0	0	0
Mali	8,824	0	0	0	0	<1	1	1	0	0	0	0	0	0
Mauritania	1,916	0	0	0	0	5	4	4	0	0	0	0	0	0
Mauritius	1,077	0	0	0	0	12	6	6	0	0	0	0	0	0
Morocco	23,910	7	1	126	100	23	233	251	51	18	115	115	101	108
Mozambique	14,845	2	0	10e	0	2	17	17	1	1	2	2	0	0
Niger	6,688	0	0	0	0	1	3	3	0	0	0	0	0	0
Nigeria	105,471	5	2	170	140	8	403	403	51	52	79	79	39	40
Rwanda	6,755	0	0	0	0	2	5	5	0	0	0	0	0	0
Senegal	6,978	0	0	0	0	1	4	4	0	0	0	0	0	0
Sierra Leone	3,946	0	0	0	0	1	1	1	0	0	0	0	0	0
Somalia	7,106	0	0	0	0	1	2	2	0	0	0	0	0	0
South Africa	33,747	17	10	2,000e	2,160e	85	1,260	1,309	1,230	1,220	1,581	1,661	1,840	1,885
Sudan	23,797	2	0	7	0	3	26	29	0	0	10	10	0	0
Swaziland	737	1	1	5e	180	9	2	3	-3	5	2	3	180	178
Tanzania	25,397	2	4	69	76	1	14	16	37	35	32	30	37	35
Togo	3,247	0	0	0	0	<1	0	0	0	0	0	0	0	0
Tunisia	7,809	5	1	50e	25e	27	90	97	30	30	30	37	20	20
Uganda	17,189	1	0	5e	0	1	7	7	2	2	2	2	0	0
Zaire	33,755	1	0	4e	0	1	11	11	2	2	3	3	0	0
Zambia	7,851	1	0	30	0	1	7	5	0	0	3	5	0	0
Zimbabwe	9,125	3	2	90	41	22	84	90	59	62	80	82	37	40
Africa	**604,442**	**89**	**36**	**3,092**	**3,103**	**12**	**3,222**	**3,319**	**1,787**	**1,754**	**2,355**	**2,445**	**2,474**	**2,526**
TOTAL WORLD	**5,110,362**	**4,185**	**1,160**	**245,126**	**172,361**	**98**	**213,871**	**224,056**	**154,023**	**159,365**	**215,167**	**226,329**	**154,478**	**160,551**

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Top 20 producing nations

Taiwan

Population: 19,900,000. Per capita consumption of paper and board: 149 kg/327 lb. Paper and board mills: 152. Pulp mills: 3 (sulfate: 2; nonwood: 1).

Paper/board capacity: 3,250,000e tons **Pulp capacity:** 500,000e tons

	Production		Imports		Exports	
	1987	**1988**	**1987**	**1988**	**1987**	**1988**
Paper	2,091	2,282	276	335	67	146
Board	646	667	12	8	78	101
Total	**2,737**	**2,949**	**288**	**343**	**145**	**247**
Chemical woodpulp	331	350	335	367	65	86
Bleached bagasse	73	73	0	—	16	14
Mechanical, other pulps	12	2	44	74	1	1
Total	**416**	**425**	**379**	**441**	**82**	**101**

United Kingdom

Population: 56,799,000. Per capita consumption of paper and board: 163 kg/360 lb. Paper and board mills: 92. Pulp mills: 7 (semichemical: 2; mechanical: 3; nonwood: 2).

Paper/board capacity: 4,676,000 tons **Pulp capacity:** 466,000 tons
Operating rate 1988: 96% **Operating rate 1988:** 95%

	Production		Imports		Exports	
	1987	**1988**	**1987**	**1988**	**1987**	**1988**
Paper	3,337	3,410	4,396	4,965	458	608
Board	846	885	887	823	274	190
Total	**4,183**	**4,295**	**5,283**	**5,788**	**732**	**798**
Chemical woodpulp	NA	NA	1,737	1,851	1	1
Mechanicals, other pulps	NA	NA	203	237	3	7
Total	**389**	**421**	**1,940**	**2,088**	**4**	**8**

United States

Population: 245,414,000. Per capita consumption of paper and board: 317 kg/69 lb. Paper and board mills: 548. Pulp mills: 217 (sulfate: 125; sulfite: 17; semichemical: 36; mechanical: 39).

Paper/board capacity: 72,862,000 tons **Pulp capacity:** 56,860,000 tons
Operating rate 1988: 95.4% **Operating rate 1988:** 97.7%

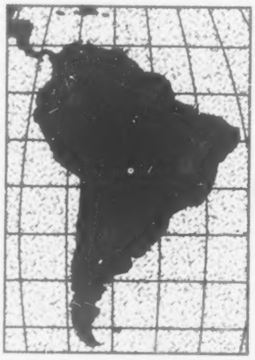
	Production		Imports		Exports	
	1987	**1988**	**1987**	**1988**	**1987**	**1988**
Paper	56,546	58,264	10,864	11,109	2,978	3,355
Board	10,988	11,213	137	102	1,079	939
Total	**67,534**	**69,477**	**11,001**	**11,211**	**4,057**	**4,294**
Chemical woodpulp	47,663	48,899	4,137	4,010	3,749	4,212
Mechanicals, other pulps	6,363	6,631	263	561	687	803
Total	**54,026**	**55,530**	**4,400**	**4,571**	**4,436**	**5,015**
Market pulp	7,361	7,770	2,935	3,149	4,373	4,600

U.S.S.R.

Population: 283,682,000. Per capita consumption of paper and board: 38 kg/83 lb. Paper and board mills: 173. Pulp mills: 54 (sulfate: 21; sulfite: 34; semichemical: 7).

Paper/board capacity: 11,494,000 tons **Pulp capacity:** 9,244,000 tons
Operating rate 1988: 94e%

	Production		Imports		Exports	
	1987	**1988**	**1987**	**1988**	**1987**	**1988**
Paper	9,348	9,500e	225	235e	906	905e
Board	1,218	1,250e	—	—	—	—
Total	**10,566**	**10,750e**	**555**	**575e**	**1,252**	**1,300e**
Chemical woodpulp	7,180	7,225e	222	221e	1,088	1,096e
Mechanicals, other pulps	2,794	2,840e	3	4e	—	—
Total	**9,974**	**10,065e**	**225**	**225e**	**1,088**	**1,100e**
Market pulp	3,212	3,250e	225	225e	1,088	1,100e



Latin America

The performance of the Latin American paper and board industries was disappointing in 1988. Output of paper and board crawled ahead by less than half of one percentage point to 10.5 million tons in the face of weak domestic markets. But pulp production rose a more healthy 3% to 7.3 million tons on the back of good export sales.

The overall picture in 1989 is one of contrasts. Ingrained economic problems in many countries are retarding industry development. Yet investment activity in the pulp and paper industry has never been stronger, with large amounts of foreign money flowing in.

Brazil, the continent's dominant producer, is the key example of this paradox. Its economy is stalled, with inflation apparently out of control, foreign debt running above $100 million, and its financial, social, and political institutions too weak to do anything about it. In 1988, the overall industrial growth index of the country fell by 3.2%. Yet pulp and paper industry investment plans valued at $8.800 million are on the drawing board and will double production by 1995. The reasons for investor confidence despite the poor showing of the industry are clear: Brazil has the fastest-growing pulpwood trees in the world. And its pulp and paper industry is now a recognized and established exporter, earning $1.4 million of Brazil's balance of payments surplus of $19 million.

Among the most noticeable expansion projects are Aracruz Celulose SA's 520,000-tpy expansion to 1 million tpy by the end of 1991, Cenibra SA's new 350,000-tpy line, and Bahia do Sul's 420,000-tpy pulp mill for startup in 1992. Other projects include Copener/Riocell's 340,000-tpy mill, for which a third partner is being sought and a project formulated by a consortium of nonintegrated papermakers for a 350,000-tpy mill, which is believed to be at an advanced stage. Many other proposals are under discussion, including a plan by Champion International's Brazilian subsidiary to build a new pulp and printing/writing paper mill in the state of Mato Grosso do Sul and preliminary studies by Jari to double capacity in the late 1990s.

New paper machines are also being planned by Ripasa SA, which is building a 145,000-tpy paper machine with 70% of the output destined for export, and Grupo Votorantim, which is installing two paper machines at the former Guatapara mill. Pisa, part of the New Zealand group Fletcher Challenge, is building a new newsprint paper machine for startup in 1994. The booming export business is attracting newcomers to the industry. Most noticeable is Inpacel, a subsidiary of a bank, which is to begin pine chemi-thermomechanical pulp (CTMP) and mechanical printing paper production in 1991.

But the investment boom is not limited to Brazil. Even in Argentina, which arguably is Latin America's most turbulent economy, some reason for optimism exists. Most noticeable is a project between domestic company Arcor, Citicorp, and BAT Industries to build a new 300,000-tpy eucalyptus pulp mill in the Entre Rios province. Canadian interest has also been strong, with Consolidated-Bathurst Inc. combining with two domestic companies to study a 100,000-tpy CTMP mill

Across the border, in the more stable economic climate of Chile, three major projects are pressing ahead. Shell International, Scott Paper Co., and Citibank have combined to build the 265,000-tpy Santa Fe pulp mill for startup in 1992. It will be the first mill in Chile to use plantation eucalyptus. The rest of the industry is based on radiata pine. Celulosa Arauco y Constitucion has also given the green light to a major new pulp line at its Arauco mill. Also for startup by the end of 1992, it will make 350,000 tpy of bleached kraft pulp. Chile's other major company, CMPC, has teamed up with the Simpson Paper Co. of the U.S. for its major project—a 315,000-tpy bleached kraft pulp mill, Celulosa del Pacifico, which should start up by the end of 1990.

Further north, Venezuela is investing $300 million in new plant and equipment. Among the investments are Cartonera del Caribe Ca's new 50-tpd packaging board paper machine, an extra 30,000 tpy of capacity at Smurfit Cartones Nacionales SA, and an extra 90,000 tpy of capacity at Venepal. Colombia meanwhile is planning marginal increases in capacity in 1989, with the startup of the 87,000-tpy Papelcol SA mill in 1990.

The performance of Central America is dominated by Mexico. In 1988, the Mexican economy showed some positive signs, with a modest GNP growth of 1.1% and a rapid fall in inflation due to austerity measures. But the massive debt problem persists. Under these circumstances, paper and board output rose slightly to 2.6 million tons, and consumption rose 3.6%, largely fueled by imports. Several large projects are planned, and some of the output will be destined for export. Industrias Centauro's 250,000-tpy linerboard machine should start up this year. Grupo Durango is building a second pine market CTMP line near Durango City. Capacity will be 75,000 tpy. An 80,000-tpy fine paper machine will be installed by Ponderosa Industrial at Celulosa de Chihuahua mill.

The outlook for Latin America for the end of this year and 1990 hinges on finding solutions to the continent's long-term economic problems. If that could be done, the current interest of foreign investors could become a flood of venture capital. ■

Europe

Total paper and board output in Europe rose 5.6% to 75.2 million tons in 1988. Within that total, different parts of the continent enjoyed varying fortunes: Western Europe (including the Nordic countries) recorded a rise in output of 6.8% at 57.4 million tons. Eastern Europe turned in a relatively static performance, with output up by an estimated 1.8% to 17.9 million tons. Apparent consumption for the whole continent also set a new record at 71 million tons, up 5.5%, and apparent per capita consumption was 91.2 kg (200.6 lb). Again, there was a disparity between West and East. For the western nations, per capita consumption averaged 152 kg (334.4 lb); for the eastern countries, it was slightly below the world average at an estimated 40 kg (88 lb).

Production of pulp in Europe also reached a new record level, rising 3.9% to 47.3 million tons. Some 32.7 million tons of the total was produced in Western Europe. Apparent pulp consumption was 50.7 million tons for the whole continent, another record.

The nations of the European Community (EC) had an exceptional year in terms of both output and investment. Advertising and commercial print boomed, pushing up demand for printing paper, while strong growth (economic overheating in some countries) kept the packaging sector buoyant.

The EC's biggest producer, Fed. Rep. Germany, again set new highs for paper and board production and consumption. Its output of all grades passed 10 million tons for the first time, rising 6% to 10.6 million tons. Some 42% of the output is printing grades, while packaging grades account for 37%. France's paper producers put in an impressive performance, with output rising 8.2% from 1987 to 6.3 million tons. Consumption rose even faster, up 9.2%. Italy also set records, with output crossing 5 million tons for the first time. The U.K.'s output climbed steadily by 2.7% to 4.3 million tons.

Many paper producers feel that the removal of internal barriers to trade within the EC at the end of 1992 will make little difference to their business activity. They argue that pulp and paper are already internationally traded commodities; the removal of borders will merely simplify customs controls. But many are expecting deregulation of the transport systems in Europe, which should cut costs, and more central regulation of political issues, such as the environment. Changes will also probably occur in distribution patterns.

Producers from outside the EC, however, have fears of being excluded when European borders are removed.

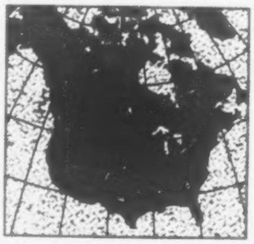
A boom in investment has taken place in the EC in the past two years, with Nordic and North American companies arriving in strength. It would be wrong, though, to say that all of this investment is driven by the opening of borders in 1992. Rather, it is a response to the formation of a single market of 320 million people, to the competitive advantages to be found by making commodity grades of paper closer to their consumers, and to the comparatively low per capita consumption of some (mainly southern) EC countries.

For the Nordic nations of Sweden, Norway, and Finland, 1988 was another year of full capacity utilization. Finnish output of paper and board, having crossed 8 million tons for the first time in 1987, passed 8.5 million tons in 1988. Sweden rose above 8 million tons for the first time. Norway maintained its full capacity output level of around 1.6 million tons. Over the past six record years, the Nordic industry has slimmed down into internationally powerful papermaking groups. A reassessment of investment policy, with more high-value-added products in the Nordic countries and more bulk-grade production moved nearer to the consumer markets, has been one result of this.

In Eastern Europe, after years of stagnation, there are moves to revitalize the pulp and paper industry. Nowhere is this more apparent than in the U.S.S.R. Although it is the fifth-largest paper producer in the world, the U.S.S.R. has a per capita consumption below the world average. New plans formulated by the ministry responsible for the pulp and paper industry have set a target of doubling per capita consumption by 1995. The plans foresee major investment and an opening up of the Soviet industry to foreign capital. Investors from outside the U.S.S.R. may participate in joint-venture projects, especially in the newsprint, printing paper, and market pulp sectors. Depending on circumstances, they will be allowed to hold a majority share of the joint ventures formed, set market prices, and repatriate funds to their shareholders abroad.

Already there are some takers: Finnish company Metsä-Serla is building a joint-venture tissue mill in Estonia, and companies in Austria, Canada, Italy, and Fed. Rep. Germany are believed to be involved in talks with Soviet authorities.

If the plans advance rapidly, several foreign companies may find the U.S.S.R. an attractive place to invest. Its large population, low per capita consumption, and big forest reserves could well justify the investment. And if the U.S.S.R. sets a course of letting in foreign capital, most other eastern European nations may well follow.■



North America

North American pulp and paper producers operated their mills at close to maximum capacity last year and reported record profits. Continued economic expansion in the U.S. and Canada supported the third successive year of production gains for the industry. Exports were assisted by the low value of the U.S. dollar against other currencies.

Total North American output of paper and board reached a record-high 86.2 million tons in 1988, up 3.1% from 1987. Among individual grades, newsprint output was up 2.8% to 15.39 million tons, printing/ writing paper was up 6.8% to 22.7 million tons, and packaging grades were up 2.6% to 29.17 million tons (kraft linerboard production rose 4.2% to 17.59 million tons). Total imports rose by 4.4% to 12.2 million tons, while total exports reached 15.7, up 3.4% from 1987.

Pulp production in North America climbed to 78.84 million tons, a 2.2% increase. Market pulp output was 15.9 million tons, up 3.6% from 1987. Pulp exports climbed to 13.1 million tons, a 10% gain from 1987.

Wastepaper consumption in North American mills increased 4.6% to 18.5 million tons. Wastepaper exports jumped 20% to 5.0 million tons.

In the large U.S. market, strong demand from the printing and publishing industry as well as increased use of office copiers and personal computers pushed domestic output of printing/writing paper up 5.2% to 19.59 million tons and raised imports by 16.6% to 2.5 million tons. The continued growth of consumer packaged goods stimulated demand for all major grades of casemaking materials. Total production of containerboard grew 2.2% to 21.3 million tons, while boxboard packaging grades grew 3.3% to 7.1 million tons. Among other grades, tissue paper production increased 3.3% to 5.0 million tons.

Canada's industry produced 24.9 million tons of pulp, paper, and paperboard in 1988. Nearly 90% of the newsprint and 35% of the pulp produced by Canadian companies is exported, and most of Canada's exports are destined for the huge U.S. market. Newsprint output grew 3.1% to nearly 10 million tons, but shipments slackened off at the end of the year as demand weakened. Printing/writing and specialty paper output increased 9.7% to 3.4 million tons, stimulated by strong demand in the U.S. and Canada. Packaging paper and board output remained almost unchanged at 3.3 million tons. Market pulp exports were up about 1.1% to 8.16 million tons.

This year, it seems that production gains will not match those achieved in 1988 because economic expansion and demand growth in both Canada and the U.S. will be lower than last year. ■

RAW MATERIALS/WOODYARD

SPOTTED OWL CONTROVERSY ADDS TO PACIFIC NORTHWEST TIMBER CRUNCH

As supplies tighten, the region looks for ways to balance its forest products industry with environmental concerns, export demands

By PERTHENIA A. HYDE

The forest products industry is struggling to overcome the timber supply problems plaguing production throughout the Pacific Northwest. The entire industry is making changes to secure its future, including the profitability of pulp- and papermaking in the region. While skirmishes over the northern spotted owl tie up the courts, the timber supply dwindles.

The problem is reaching crisis proportions as sawmills throughout Oregon and Washington close. According to Bill Pickell, Washington Contract Loggers Assn., 34 mills have closed in the past 18 months. Most sawmills are running on reduced supplies, substantially raising the price of residual chips. "The general tightness in the chip supply has been caused by a number of sawmills closing down," explained Bob Fukano, Mitsubishi International Corp., Atlanta, Ga. "There isn't as much residual chip being made, so they have to whole-log chip, which is a costlier operation," he said. Because 75% to 85% of the pulping fiber used in the Pacific Northwest comes from plywood and sawmill residue chips, the timber shortage will ultimately affect pulp and paper manufacturing.

Several factors support the current supply shortage. According to analyst R.W. Hammerstedt, the Pacific Northwest faces the phenomena of "falldown," the slack period before second growth becomes available for harvest and after large-scale logging of primary timberstands occurs. This process is expected to create a trend toward smaller tree size and lower volume of available timber throughout North America.

This general downturn in timber supply has been compounded by environmental concerns and heavy exportation. Sawmills, after two years of high production, now face general reductions in U.S. Forest Service (USFS) timber available for harvest, court injunctions that further limit access to public forestlands, and high export demand for unprocessed logs.

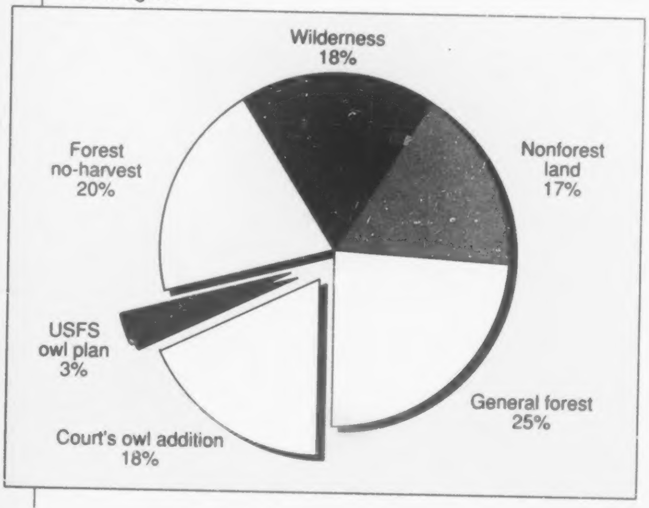
The forest products industry is starting to make itself heard on all issues impacting timber supply. Grass roots groups are sprouting up all over Washington and Oregon to make the public aware of the crisis. In June, 650 log trucks paraded through downtown Seattle, Wash., to demonstrate the importance of forest products to the state's economy. The same weekend, in Eugene, Ore., a similar demonstration attracted 1,327 logging trucks. A rally in Salem, Ore., was attended by 2,000 industry supporters from all over the region.

Most timber supply problems confronting the Pacific Northwest affect sawmills and plywood plants. Right now, demand for pulp is strong in both foreign and domestic markets. "Prices are about double what they were a few years back," said a fiber supply manager, "but there are a few clouds on the horizon."

SUPPLY THREATENS INDUSTRY. Pulp producers do not have current shortages but may face dwindling chip supplies while pulp demand remains high. "The concern is about what will happen to our supply," said Mike Sullivan, Potlatch Corp., Lewiston, Idaho.

Ms. Hyde is a summer intern for Pulp & Paper from the Univ. of Puget Sound, Tacoma, Wash.

FIGURE 1: **National forestland allocations in western Oregon and Washington.**



Log trucks clogging downtown Seattle are a reminder of the forest product industry's role in local economies (photo by Kurt Smith, *Seattle Post-Intelligencer*).

"Most of our pulp and paper mills in the Pacific Northwest rely substantially on chips that are produced from plywood manufacturers and sawmill operations that are dependent on national forest timber, so we stand to have a reduction in our supply of chips furnished for papermaking if those mills suffer from a lack of logs," Sullivan explained. According to the Northwest Forestry Council, 55% of the 12 million bone-dry units (bdu) used for pulp mill fiber comes from logs harvested on public lands.

"The slowdown could potentially come late this year or early next year, when sawmills that don't have any stumpage ledger or have a very small stumpage ledger in front of them will have to start to level off," explained an area fiber supply manager. Chip prices are soaring due to sawmill closures, a downturn in housing starts, and strong demand for woodfiber from both foreign and domestic markets.

HOUSING STARTS ARE DOWN. An important indicator of industry strength, May housing starts declined 2.1% to an adjusted annual rate of 1.31 million. Construction rates fell 13.5% from April 1988. Housing starts, with little hope of reversing, wallow at their lowest levels since December 1982, when high interest rates drove the housing industry down and reduced demand for processed lumber.

MULTIPLE-USE CONFLICTS STOP SALES. Even if the level of housing starts dropped to the 1981-82 level, timber would still be in short supply. The real battle the industry faces is in the courts and in Congress. Court injunctions stopped 163 timber sales of federal lands from taking place in western Washington and Oregon this year.

"Our problem here in the Pacific Northwest is a fixed land base and a growing population," said John Marker, USFS. "A lot of people are involved in the issue of how that land should be used. The timber industry is only one group that wants access to the resources on national forestlands. Multiple-use issues, such as protection of watersheds and fish spawning streams, are compounded by preservationist groups pushing to protect the ancient forests."

"Right now, we are looking at a program that would be reduced outside of the spotted owl controversy," Marker said. Measures to protect the spotted owl have added to the planned reductions of 15% to 20% of allowable cut in the next five years.

This year, the USFS's annual sale program in Washington and Oregon has come virtually to a halt due to court injunctions, primarily over the northern spotted owl. The northern spotted owl seems to nest and reproduce only in the ancient forestlands. The spotted owl, environmentalists claim, is an indicator species for other animals that prefer to reside in old-growth forestlands. USFS and the Fish & Wildlife Service are currently collecting evidence on the number of owls living in the affected areas, their breeding habits, and their habitational requirements to help decide whether or not to list the birds as threatened or endangered species. Although Fish & Wildlife has recommended that the owl be listed as a threatened species, the courts are requiring more evidence before they rule on the injunctions. At the same time, both agencies have begun the lengthy process required by the Endangered Species Act. "We've started working on the process, which could take about a year," Marker said. "We haven't been stopped from selling timberlands by the endangered species law but by the court injunctions."

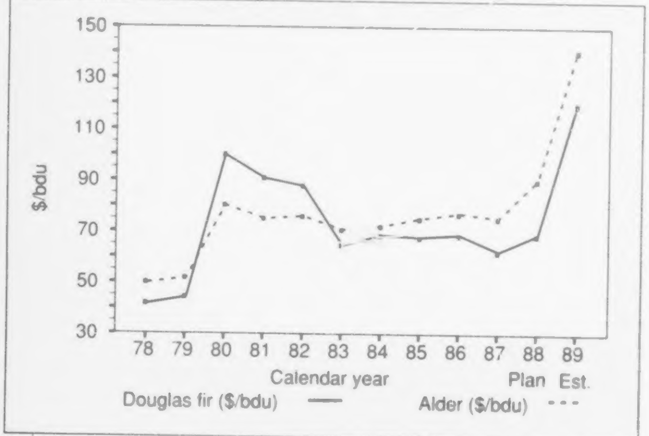
The courts have, at the request of Fish & Wildlife and USFS, indefinitely postponed the trial involving lands under injunction because of the spotted owl. At this time, all 163 timber sales are also postponed indefinitely. When the case finally goes to trial, according to Marker, USFS hopes to bring in new evidence to show that the injunction is not needed.

The court injunctions and appeals process alone will limit USFS to selling only half of its harvest plan for 1989 and perhaps 60% in 1990. Normally, USFS offers 4.8 billion bd ft for sale annually. One and a half billion bd ft are currently under injunctions, nearly 24% of 1989 planned sales. USFS thinks it will "be able to offer a program but probably only a modest one at best, compared to what we've done in the past," according to Marker.

The National Forest Products Assn. (NFPA) and several industry officials believe the spotted owl in the Pacific Northwest is an indication of long-term disagreements over land use facing the industry. Environmental issues like those plaguing the Pacific Northwest are surfacing throughout the U.S. In the South, 65 timber sales from federal forestlands are tied up by controversies over the endangered red-cockaded woodpecker. Unlike northwestern mills, however, most southern mills do not rely heavily on federal timber harvesting. This lack of dependency makes environmental concerns less detrimental to their manufacturing costs.

EXPORTS AFFECT SUPPLY. Although the spotted owl has received a great deal of blame for the current timber supply crunch, many believe the real shortage is caused by heavy exports of raw logs to Asia. Some sawmill workers in Washington and Oregon, nearly out of a job at mills that rely heavily on federal timber, have seen truckloads of timber from private and state land loaded onto ships for export. Bans prevent the export of logs from national forestlands, but record exports from state and privately managed timberland are crossing the ocean, primarily to Japan, making it a major competitor for the limited timber supply.

FIGURE 2: **Douglas fir and red alder pulp fiber cost trends.**



While the lumber industry struggles to survive this difficult period, pulp and paper manufacturers battle soaring woodchip costs. With prices higher than they have been in years, little interest exists in simply waiting out the crisis. In June, the export price for Douglas fir was $118.00/bdu f.o.b./vessel, and red alder was selling at $117.00/bdu f.o.b./vessel. By comparison, in second-quarter 1986, Douglas fir sold for $77.40/bdu f.o.b./vessel and alder brought in $90/bdu/f.o.b./vessel. These huge jumps reflect the current high demand for chips.

Currently, the tight market is creating "a psychology of shortages," according to Sullivan. "The spotted owl is adding to this psychology. All timber off public lands is sold by silent auction, and fear is pushing prices up." From third-quarter 1987 to third-quarter 1988, the price of U.S. Forest timber rose from $130 to $160/1,000 bd ft. Now, the timber is not available even at elevated prices. This situation, combined with environmental problems facing the region, sent some industry leaders to their government representatives.

SPLIT OPINIONS ON LEGISLATION. Some congressional leaders are taking action. Sen. Robert Packwood (D-Ore.) and Rep. Peter DeFazio (D-Ore.) have both initiated legislation that would provide individual states with the power to decide where their raw logs should be processed. This legislation challenges a 1984 Supreme Court ruling. That ruling found an Alaskan law, which required that logs taken from state-managed lands be processed prior to export, in violation of the federal authority's right to regulate international trade. Currently, states do not have the power to make legislative decisions that involve foreign trade, which is considered a part of foreign policy.

Some members of the Pacific Northwest's contingency to Washington D.C. are not in favor of Packwood's bill. Washington Sen. Slade Gorton opposes the legislation for two reasons. First, Packwood's bill allows individual states to set foreign trade policy. In addition, Gorton believes that the clause included in Packwood's bill allowing the practice of substituting logs exported from private- or state-managed lands would hurt small mills in Oregon and Washington.

Optimistic about the message Congress is sending out, Idaho has already begun enacting legislation that would permit only 5% of timber from state-managed lands to be offered for export. On June 27, 1989, Oregon voters decided overwhelmingly to keep state-managed timber available to local mills with a similar initiative.

The Washington state constitution requires that the state sell timber from its 1.5-million acres to the highest bidder, but it does not specify any requirements for the 621,000 acres of land the state manages for its counties. Washington Gov. Booth Gardner is currently looking into using these lands to aid struggling local sawmills.

While some involved in the region's forest products industry push for legislative restrictions, others lobby for greater freedom. The Bush Administration has announced a plan to remove the ban on timber exports from federal lands to generate favorable trade with Japan and reduce the trade deficit. While this action would lower export prices, it could make stumpage more expensive for domestic mills and increase sawmill closures in the Pacific Northwest, making the chip supply even tighter. In light of recent allegations of unfair trade practices made by U.S. Trade Rep. Carla Hills and substantial congressional support for Sen. Packwood's second bill making the export ban a permanent law, the Bush Administration probably will not pursue this plan.

Sen. Mark Hatfield (R-Ore.) organized a summit meeting between industry leaders, politicians, and environmental groups to work toward resolving the complicated issues surrounding timber supply. The goals of the June 24 meeting were to establish nonlegislative plans and to assess the need for long-term legislative answers. Although the summit was primarily for fact finding, the congressional delegation proposed a short-term solution to the timber supply problem.

The proposed compromise between the industry and environmental groups would have limited the amount of net merchantable sawtimber available out of the ancient forests but would have created a dependable flow of timber through 1990. Currently, the allowable sales quantity (ASQ) for USFS is 4.35 billion bd ft for 1989 and 4.5 billion bd ft for 1990. The proposed reductions would have changed USFS's ASQ to 3.8 billion bd ft for 1989 and 4.2 billion for 1990. The proposal also called for limiting ASQ from Bureau of Land Management forests to 2 billion bd ft during fiscal 1989 and 1990.

If all parties had agreed on it, this proposal would have become part of a federal USFS budget appropriations bill for 1990. In return, the nine environmental groups involved in litigation over the spotted owl would have ended in 1989 court cases tying up federal lands. The compromise, however, was declined by environmental groups concerned about the exact wording of the proposal.

The industry is uniting to push for public awareness through national channels as well. NFPA joined with other forest industry trade associations and forest user groups in forming the American Forest Resource Alliance (AFRA). AFRA's purpose is to unite the industry to obtain a reliable wood supply. One goal of the Alliance is to mount a publicity campaign presenting the industry's views on issues like the spotted owl.

INDUSTRY MEETS SUPPLY CHALLENGES. Aside from the publicity and legislative measures being proposed, the pulp and paper industry must examine its future. "All options are being explored by everyone in our industry," said Sullivan. "Everything becomes an option when supplies get tight," he noted.

Pulp mills are using more salvage wood and paying higher prices for hard-to-recover wood. "A dramatic difference exists between land harvested two years ago and now," explained Sullivan. "A lot of material used to be left behind because, with the variable chip prices, it was uneconomical to bring it out. Economics alone justify bringing it out now," he said. Some companies ship timber to woodyards with the tops left on for chipping.

In addition to spending more on whole-log chipping and cleaning up the forest floor, some Pacific Northwest mills may transport chips from the South or add more facilities for wastepaper recycling, and some offshore companies are looking at buying southern pine chips.

Kenneth Clemens, Southern Wood Products Marketing Group, Mobile, Ala., commented, "It gets to the point where the price for fiber (for export) in the South with freight is the same as or lower than the price in the Pacific Northwest." The last time prices reached that type of equilibrium was in 1980, causing the volume of southern exports to Japan to increase dramatically.

"The constricting supply and increasing prices in the Pacific Northwest will hurt our competitive position," according to Sullivan. "The Southeast has the potential for becoming a strong competitor," he said. Currently, some major exporting companies are encouraging Japanese buyers to divert ships to southern ports for pine, but there is very little interest.

Domestic pulp and paper producers are uncertain about transporting southern chips for use in Pacific Northwest mills. Longview Fibre Co., Longview, Wash., is discussing the potential of southern woodchips as a possible future chip source. According to Longview Fibre spokesman Curt Copenhagen, the company is exploring transportation costs, the key factor in the decision. Longview is also doubling its capacity to recycle old corrugated containers.

WHAT DOES THE FUTURE HOLD? As pulp and paper mills throughout the Pacific Northwest face the supply crisis, they optimistically look to the future of the industry. "We have some current difficulties, but we've been there before," a supply manager from a large mill explained. "There are a number of adjustments we can make that will bring us back into a better situation. There are many in our industry that have the capability to use secondary fiber but are not doing so. In the future, we'll see a lot more secondary fiber used by the brown board, newsprint, and tissue industries. It might get worse before it gets better, but things will adjust."

Sullivan commented, "Our management here in Idaho has made a commitment to invest nearly a half-million dollars in our pulp and paper and related operations. Those investments are being made on the conviction that the pulp and paper industry's future is very strong from a market standpoint and from the standpoint of available labor force and adequate timber markets. The only problem is an adequate chip supply." ■

PULP & PAPER

September 1989

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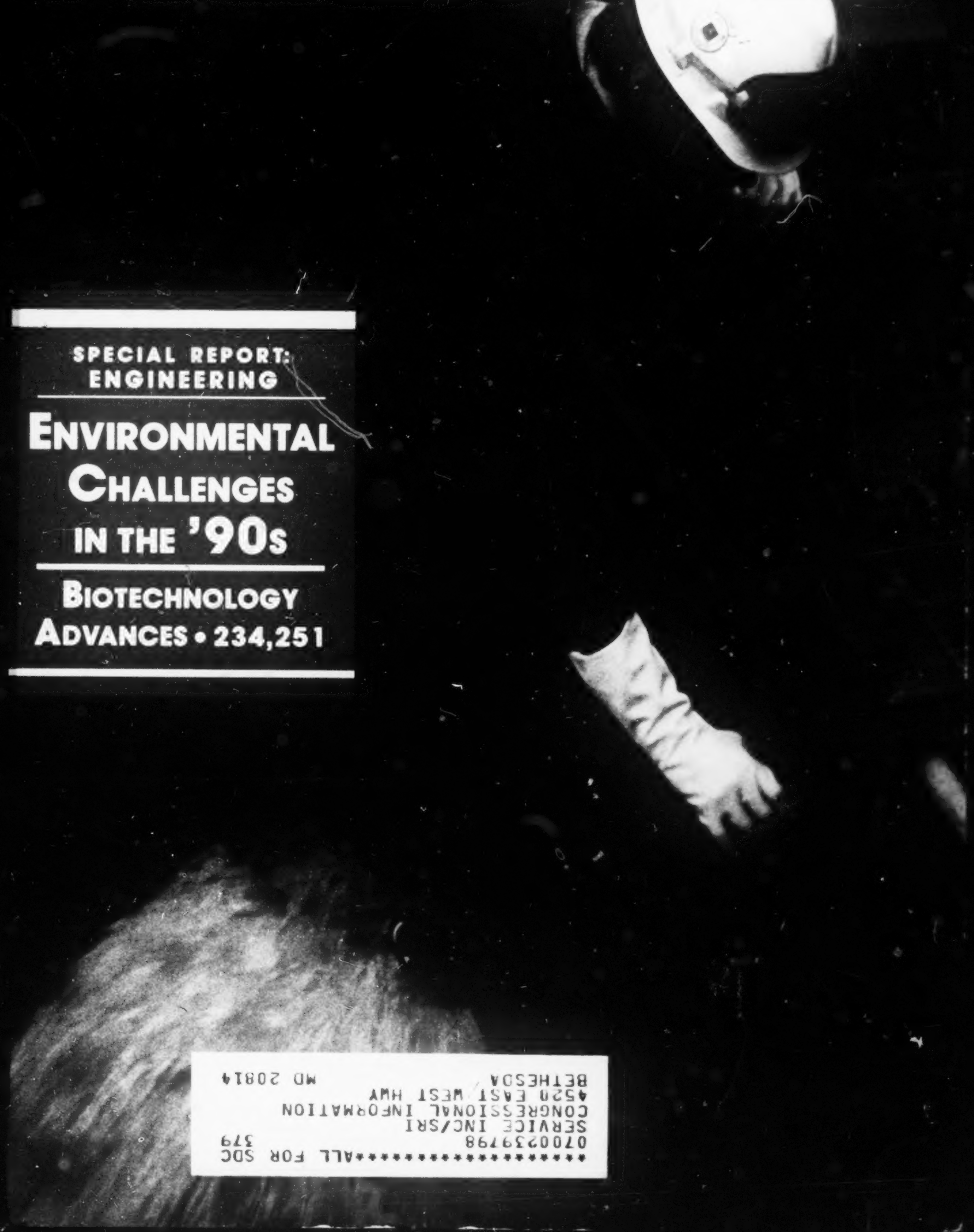

SPECIAL REPORT: ENGINEERING

ENVIRONMENTAL CHALLENGES IN THE '90s

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SEPTEMBER

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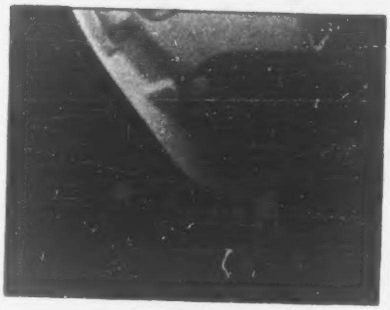
This issue's 20-article special report on environmental engineering in the paper industry looks closely at new technology now being implemented at U.S. and Canadian paper mills as public concern over the environment grows and government regulations tighten. **(Photo by Jay Storr, Houston, Texas.)**



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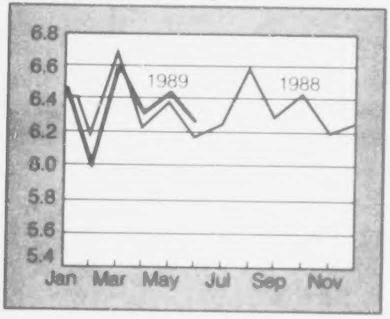
ABP

BPA

U.S. paper and board production



U.S. production of paper and paperboard totaled 6.2 million tons in June, down 1.1% from the same month last year, according to the American Paper Institute. Due to sluggishness in the general economy, production for the first half was off 0.5%, after seasonal adjustments, to an annual rate of 76.3 million tpy. The paper sector was responsible for the decline, falling 1.6% through June, while paperboard posted a 0.6% gain.

Among major grades, coated paper continued to suffer from lower shipments to magazine and book publishers. Uncoated free-sheet markets for office reprographics were strong but not strong enough to offset weaker markets for commercial printing paper and business forms. Production of containerboard for domestic use was up 0.8% through June, supported by strong demand from box makers. Shipments of fiber boxes were up 1.8% through the first half.

Canadian newsprint shipments totaled 821,000 metric tons in June, down 3.5% from June 1988, bringing first-half shipments down 2.3% from last year. Operating rates slipped from 99% in first-half 1988 to 96% this year. Pulp shipments were off 1.1% in the first half, with mills operating at 93%. ■

		Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION[1]					
Newsprint	June	498	1.6	5,931	-0.8
Uncoated groundwood (s)	June	132	10.0	1,705	8.0
Coated paper (s)	June	554	-10.2	6,922	-6.6
Uncoated free-sheet (s)	June	853	-9.0	11,105	-1.8
Other printing/writing	June	123	0.0	1,516	0.5
Total packaging and other paper (s)	June	401	-5.2	4,869	-4.3
Tissue	June	466	2.6	5,592	2.6
Total paper	**June**	**3,026**	**-4.4**	**37,640**	**-1.9**
Unbleached kraft paperboard	June	1,644	3.8	19,488	0.7
Semichemical medium	June	468	0.4	5,692	1.6
Bleached paperboard	June	393	7.4	4,486	-0.5
Recycled paperboard	June	717	-2.7	8,750	-2.7
Total paperboard	**June**	**3,222**	**2.2**	**38,416**	**0.3**
Total U.S. paper and paperboard output	**June**	**6,247**	**-1.1**	**76,056**	**-0.8**
PULP, WASTEPAPER & [illegible][2]					
Total U.S. woodpulp production	May	5,087	1.7	62,097	1.9
Market pulp production	May	720	9.9	8,817	4.8
Wastepaper consumption at paper/board mills	May	1,624	0.8	18,895	0.0
Pulpwood consumption (cords)	May	8,112	6.0	97,238	1.3
CONVERTED PRODUCTS STATISTICS[3]					
Corrugated box shipments (billion ft²)	June	26.391	1.8	157.055[6]	1.8
Containerboard inventories at U.S. box plants and mills	June 1	2,495	-3.9		
INTERNATIONAL TRADE[2]					
U.S. paper imports (including products)	May	1,147	4.7	12,913	0.1
Imports of Canadian newsprint	May	723	-2.4	8,053[6]	-6.7
U.S. paper exports (including products)	May	591	30.8	6,356	13.9
Exports of unbleached kraft linerboard	May	232	45.0	2,367	8.7
Exports of woodpulp	May	504	16.4	6,277	18.3
Norscan pulp inventories[4]	June 30	773	15.4		
Norscan pulp operating rates[4]	June	97 %	95 %	96 %	98 %
CANADIAN STATISTICS[5] (reported in metric tons)					
Total newsprint shipments	June	821	-3.5	4,764[6]	-2.3
Operating rates	June	95 %	97 %	96 %	99 %
Inventories held by U.S. consumers	June 30	1,302	-15.7		
Other paper/board shipments	June	546	-4.0	3,319	-1.5
Woodpulp shipments (export only)	June	696	-0.7	3,972	-1.1
Operating rates	June	92 %	98 %	93 %	95 %

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

Uncoated groundwood: Weaker newsprint affecting lower-end groundwood grades

Grade structure: Uncoated groundwood paper is a higher-value relative of newsprint. Physical properties of groundwood grades compared with newsprint include higher brightness and smoother surfaces. Gloss is added through supercalendering, allowing these grades to compete with lightweight coated (LWC) groundwood paper. Brightness levels range from 64 to 74 Elrepho, compared with 56 to 62 for standard newsprint. Basis weights range from 20 to 45 lb/3,300 ft². Primary uses include preprinted newspaper inserts and direct-mail flyers, catalogs, lower-cost business forms, Sunday newspaper magazines, and telephone directories.

Production/capacity: North American production of groundwood paper has continued to grow in the past few years, mostly in supercalendered (SC) and directory grades. Conversion of newsprint machines to make groundwood specialties has continued, and pressure from newsprint overcapacity may prompt more such conversions. Shipments by U.S. mills increased 116,000 tons in 1988 from 1987, a 7.8% increase. That tonnage primarily came from the new SC machine at Lake Superior Paper Industries Inc., Duluth, Minn. Canadian shipments, of which 78% are sent to the U.S., rose 10.2% to 1.489 million metric tons in 1988. Shipments to the U.S. were up 9.8%.

North American capacity is continuing to rise. Canadian uncoated groundwood capacity increased 9.9% in 1988 to 1.495 million metric tpy. Another 14.3% increase is expected this year, and capacity will advance by 33.6% for the 1988 to 1991 period. U.S. mills increased their capacity 2.6% in 1988 to 1.696 million short tpy, and this figure will rise 3.9% in 1989, leading to a 1988-91 growth of 10.6%, or 1.875 million tpy.

The following are some recent and future projects: St. Marys Paper Inc., Sault Ste. Marie, Ont. (131,000 short tpy, 1988); Lake Superior Paper Industries (245,000 short tpy); Consolidated-Bathurst Inc., Grand'Mère, Que. (110,000 short tpy net, 1989); and F.F. Soucy Inc., Rivière-du-Loup, Que. (22,000 short tpy, rebuild, 1989). Daishowa America Co. Ltd. has proposed a new 150,000-tpy directory paper machine in Port Angeles, Wash.; Lake Superior is studying a second 220,000-tpy machine; Cascade Inc. may build a 210,000-short-tpy machine at Port Cartier, Que.; and Madison Paper Industries may move ahead with a 170,000-tpy expansion of SC paper at its Madison, Maine, mill. Total capacity would then be 400,000 tpy.

Outlook: Fairly stable demand growth rates of 4.1%/year are expected for the next decade. Demand from the various end uses will stay relatively healthy in the next ten years. Growth for directories should average about 2.4% annually through 1993. Directory growth is being revised downward because of consolidation in the industry, particularly in the yellow pages area.

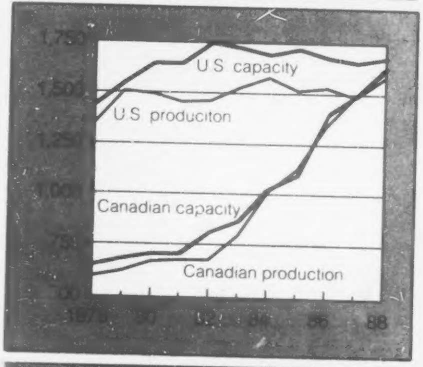
SC paper will account for about 84% of the catalog paper market by 1998. Consumption of groundwood paper for catalogs may rise about 0.15%/year through 1993. Paper for business forms will advance by about 7.5%/year through 1993.

Groundwood consumption for preprinted advertising inserts is expected to grow almost 6.5% annually, while other forms of commercial printing may consume 3.5% more paper each year. Magazine publishers and printers are likely to use about 2.8%/year more uncoated groundwood paper. Uncoated groundwood paper for books is likely to drop 0.9% annually through 1993.

Prices: Prices on all grades rose from late 1986 through 1988, but a somewhat weakening market has cut off any near-future increases. The most likely to rise again is SC if LWC rises first. Most grades were being discounted from list by mid-1989.

Year-end list prices for 34-lb supercalendered ($/short ton): 1986, $735; 1987, $704; 1988, $830; mid-year 1989, $830. Prices for 35-lb offset, 65 brightness: 1986, $537; 1987, $565; 1988, $675; mid-year 1989, $675. For standard 30-lb rotonews: 1986, $493; 1987, $541; 1988, $650; mid-year 1989, $650. For 15-lb 65 brightness forms: 1986, $520; 1987, $560; 1988, $720; mid-year 1989, $720. (See *P&P FactBook* for more detailed information.)

[illegible] *(000 tons)*



[illegible] short tons)

U.S.	**1987**	**1988**	**1989e**
Production¹	1,485	1,598	1,684
Capacity¹	1,653	1,696	1,762
Utilization rate	89.8	94.2	95.6
Imports	1,270	1,404	1,470
Exports	56	66	71
Apparent U.S. consumption	2,699	2,936	3,083
lb/capita	22.13	23.86	24.83
GNP ratio²	1.40	1.46	1.51
Canada			
Production³	1,498	1,641	1,822
Capacity³	1,499	1,648	1,884
Utilization rate	99.9	99.6	96.7
Exports	1,256	1,328	1,474

e = *P&P* Estimate.

1. American Paper Institute shipments. **2.** 000 tons/billion $ real GNP. **3.** Canadian Pulp & Paper Assn.

[illegible] PRODUCERS

(000 short tons)

	Annual capacity	**Market share (%)**
1. Abitibi-Price¹	525	12.1
2. MacMillan Bloedel	444	10.2
3. Canadian Pacific	430	9.9
4. ConBath²	423	9.7
5. GN Nekoosa	288	6.6
6. Boise Cascade³	270	6.2
7. Lake Superior⁴	240	5.5
8. Champion	239	5.5
9. Domtar	190	4.4
10. Madison	175	4.0

Market share of top five companies: **48.6%**
Market share of top ten companies: **74.2%**
North American capacity (1989): **4.346e**
U.S.: **1.762** Canada: **2.584⁵ million short tons**

e = *P&P* estimate.

1. Some sources indicate 475,000 short tpy.
2. Subsidiary of Stone Container Corp. **3.** Fort Frances, Ont. **4.** 50% owned by Pentair Inc. **5.** Canadian Pulp & Paper Assn. estimates 1989 capacity at 1.884 million short tons (does not include uncoated groundwoods classified as newsprint for trade purposes).
Note: Capacity figures provided by companies.

MARKET PULP

P&W to build 1,250-tpd pulp mill in Alabama

Parsons & Whittemore Inc. said that it will spend $700 million on construction of a 1,250-metric-tpd bleached softwood kraft market pulp mill located near Alabama River Pulp Co.'s 425,000-metric-tpy bleached market pulp mill in Claiborne, Ala. P&W said that when the construction of Alabama Pine Pulp Co. is completed in late 1991, total output from the Claiborne site—which also includes Alabama River Newsprint Co., a joint venture with Abitibi-Price Inc.—will amount to about 1.2 million metric tpy of pulp and paper.

With the startup of its new 650-tpd St. Anne-Nackawic hardwood mill in New Brunswick, P&W becomes the world's largest producer and seller of bleached kraft market pulp, the company said. (This would appear to give P&W total capacity of about 1.1 million tpy, which would be more than current market leader Weyerhaeuser Paper Co.'s kraft market pulp capacity, but the latter will be completing a new pulp mill in Columbus, Miss., in late 1990.) P&W sells its pulp through its Toronto, Ont.-based St. Anne Pulp Sales Co. subsidiary.

Alabama Pine will operate as a wholly owned subsidiary of P&W. P&W said the project represents the single largest industrial investment in Alabama's history. According to company reports, the new mill will use extended delignification and oxygen bleaching, and high chlorine dioxide substitution. Groundbreaking likely will occur in October. Construction of the new softwood pulp mill will permit the existing mill to run hardwood exclusively.

P&W said that the announcement of the Claiborne expansion does not preclude eventually moving forward with pulp mills elsewhere. As reported, P&W has taken an option on a piece of land at Apple Grove, W.Va., on the Ohio River. It also is looking at site in northwestern Alberta, near Fort Vermilion, on the Peace River. The site apparently has enough wood to support a 1,200-metric-tpd pulp mill. All of the expansion activity represents a dramatic turnaround for a company that was on the financial ropes only four years ago, after the last industry downturn.

- Eleven companies have demonstrated an interest in constructing a pulp mill somewhere near Columbia in southern Mississippi. A spokeswoman for the Columbia Chamber of Commerce said that no decision was imminent. ■

Paper-grade pulp capacity for top five producers by 1993 (000 a.d. metric tons).

Company	[illegible]	1993	Grades
Parsons & Whittemore Inc.	515	1,075	SBHK, SBSK, NBHK
Aracruz Celulose SA	780	1,025	Eucalyptus
Södra Skogsägarna AB	960	1,020	NBHK, NBSK
Georgia-Pacific Corp.	1,000	1,015	SBHK, NBHK, SBSK, sulfite
Weyerhaeuser Co.	880	995[1]	NBSK, NBHK, SBSK

[1] Total includes capacity at Canadian operations and excludes 460,000 metric tons of fluff pulp capacity.
SBHK—Southern bleached hardwood kraft; NBHK—Northern bleached hardwood kraft;
SBSK—Southern bleached softwood kraft; NBSK—Northern bleached softwood kraft.
Source: Parsons & Whittemore Inc.

James River to double Marathon's pulp output with $280-million expansion

James River Corp. said last month that its board of directors approved in principle plans for a US$280-million expansion at its James River-Marathon Ltd. subsidiary's bleached kraft pulp mill in Marathon, Ont. The project will lift softwood pulp capacity from 500 to 1,000 tpd when completed in late 1991. Construction is expected to begin this fall. Preliminary engineering studies were done by Sandwell Swan Wooster, Montreal, Que.

James River-Marathon is owned by James River (80%) and Buchanan Forest Products Ltd. (20%). The expansion will be paid for by the subsidiary. The project includes expansion of the existing recovery boiler, a new pulp dryer, and modifications to the pulp mill. The new pulp line will use oxygen delignification and alternate bleaching chemicals to reduce chlorine use to a minimum, the company said. It noted that dioxins are currently present in the effluent in minute quantities that are well within government standards.

The mill has a long-term timber cutting license on 1.6-million acres of timberland in northwestern Ontario, most of which is high-quality spruce and pine. Last month, the company acquired joint ownership of Dubreuil Forest Products Ltd., a lumber company located in Dubreuilville, Ont. This brought with it cutting rights to another 800,000 acres. The Marathon mill already uses woodchips from Dubreuil.

This project is part of James River's long-term strategy to balance its captive domestic pulp supply with its consumption. According to the company's 1989 annual report (fiscal year ended Apr. 30, 1989), James River bought 470,000 tons of market pulp during the year. It added about 70,000 tons of kraft pulp capacity during the period at a cost of $60 million and expects to add another 70,000 tons in 1990 at a cost of about $50 million. The Marathon expansion will close the gap by another 178,000 tpy and will consist of softwood, a grade for which the company currently has a large appetite but only a limited supply (mainly at Marathon). In addition to its domestic pulp deficit, James River also has developed about a 500,000-tpy gap in Europe due to its recent tissue acquisitions and joint ventures.

Part of the Marathon mill's output is sold on the market in North America and Europe. The company said it has not decided how much of the pulp from the new line will be sold outside. In addition to the bleached

Construction of the 100,000-tpy Nipawin, Sask., mill planned by Nortek Forest Products Ltd. was expected to begin in late July but has been pushed back until late summer or early fall, according to J. Phillip Piffer, president, Nortek. Piffer noted that the environmental review process was taking longer than expected, but startup of the mill is still scheduled for early to mid-1991.

- Asitka Resource Corp. said that plans for building a 250,000-metric-tpy thermomechanical pulp mill—possibly combined with a paper or paperboard machine of some type—in the Kalum region of northwestern British Columbia are taking longer to "coalesce" than previously expected. An announcement is now expected by early fall, with actual construction delayed until spring 1990, explained Hugh Cooper, president.

Plans may change somewhat from the original proposal based on three studies currently being reviewed, he noted. Details are not being released, but Cooper said that some type of paper or paperboard machine could be incorporated into the proposal. Two offshore joint-venture partners appear to be close to committing to the project. "Financing is definitely not a problem," Cooper said. ■

FINE PAPER

Boise commits to 318,000-tpy coated machine

Boise Cascade Corp. announced it plans to install a 318,000-tpy coated groundwood paper machine at its Rumford, Maine, publication paper mill. The $450-million project would bring the mill's capacity to 753,000 tpy, making Rumford one of the largest and lowest-cost coated paper mills in the world, said chairman and CEO John B. Fery.

Construction of the 325-in.-wide machine will depend on obtaining state and federal environmental permits. Exact timing of the project will also depend on market conditions, but work could begin in 1991 with startup of the machine in late 1993.

Installation of the machine would be the largest step taken in a project begun in 1988 to improve productivity and increase capacity. Other program components include constructing a cogeneration facility, enhancing two existing coated paper machines, and expanding the pulp mill. A complete rebuild of No. R-10 paper machine is still scheduled for spring 1990 according to company spokesman Eric Baxter.

The $52-million project is going to increase capacity by 20,000 tpy and will include a new Beloit headbox, a new top-wire former, a new four-nip press section, a smoothing press, and an infrared drying system. The machine will be down for 29 days next March during rebuild, which will enable it to produce Nos. 3 and 4 coated paper instead of No. 5. Rust International was named as the general contractor on this project.

Boise recently completed a $12-million rebuild of No. R-15, including a new headbox and improvements to the stock delivery system. Machine speed was raised from 250 fpm to 300 fpm, increasing capacity for Nos. 4 and 5 by about 20,000 tpy. When the new machine is installed, the mill plans to close down four of its older machines.

The pulp mill expansion will raise pulping capacity by 25% or by 212 tpd. When completed, a pulp dryer that has been producing roll pulp will be shut down. Boise will contribute $20 million to the $180-million cogeneration facility under construction in a partnership with Bechtel Corp. Boise will be a limited partner in the plant.

Paper produced at the mill is sold primarily for use in magazines, catalogs, direct mail, inserts and other commercial printing, and books. The mill currently has about ten paper machines, most of which are old and small in size, except for a 314-in. machine that was installed in 1981 and a 189-in. machine that was completed in 1964. ■

Major North American coated paper expansions.

Company	Location	Capacity (000 tpy)	Startup date
Blandin Paper Co.	Grand Rapids, Minn.	220 CGW[1]	1989
Champion Papers	Bucksport, Maine	33 CGW	1989
Consolidated Papers Inc.	Stevens Pt., Wis.	60 SP[1]	1989
International Paper Co.	Corinth, N.Y.	100 CF	1989
Champion Papers	Sartell, Minn.	—CGW	1989
Repap Enterprises Inc.	Newcastle, N.B.	200 to 260 CGW/CF	1989
Fraser Paper	Madawaska, Maine	—CGW	1990
Westvaco Corp.	Wickliffe, Ky.	100 CF	1990
Champion Papers	Quinnesec, Mich.	265 CF[1]	1990
Scott Paper Co.	Skowhegan, Maine	215 CF	1990
Scott Paper Co.	Muskegon, Mich.	30 CF	1990
Consolidated Papers Inc.	Wisconsin Rapids, Wis.	212 CF[1]	1991
Boise Cascade Corp.	Rumford, Maine	318 CGW[1]	1993
Proposed			
Blandin Paper Co.	Grand Rapids, Minn.	250 CGW[1]	n.a.
Bowater Southern	Calhoun, Tenn.	250 CGW[1]	n.a.
Fraser Paper Ltd	Madawaska, Maine	—CGW[1]	n.a.
GNN/MD Papier	Millinocket, Maine	—CGW[1]	n.a.
James River Corp.	St. Francisville, La.	—CGW[1]	n.a.
Mead Corp.	Escanaba, Mich.	—CGW[1]	n.a.
Pentair Inc.	Niagara, Wis.	92 CGW[1]	n.a.
International Paper Co.	n.a.	—CF	n.a.
Repap Enterprises Inc.	The Pas, Man.	—CF	n.a.
Weyerhaeuser Paper Co.	Columbus, Miss.	n.a.	n.a.

[1] New machines.

CGW = coated groundwood; CF = coated free-sheet; SP = specialty; n.a. = not available.

Source: Pulp & Paper Week.

Consolidated plans coated free-sheet machine

Directors of Consolidated Papers Inc. conditionally approved a major expansion of coated free-sheet paper at the company's Wisconsin Rapids Div. Plans call for a new 212,000-tpy paper machine at a cost in excess of $400 million. Construction is scheduled to begin in first-quarter 1990, and startup would be in late 1991.

Project approval is pending satisfactory contracts with suppliers and air and wastewater permits from state and federal agencies, the company said in a public statement. As is traditional with Consolidated, the new machine would be financed primarily through internally generated funds. It would be built west of the current facility located in Wisconsin Rapids, Wis.

The new machine would be a 285-in. fourdrinier with top-wire former and would operate at up to 3,000 fpm. No. 16 machine would produce paper grades in basis weights of 60 to 100 lb, which are used in annual reports, brochures and advertising circulars, and books. These grades have remained in strong demand, and paper from this division has remained on allocation almost continuously since 1980, a spokesman said.

Other equipment included in the project are a new power boiler and turbine, additional water filtration capacity, pulp and water delivery lines from the Kraft Div., a new stock preparation system, a new off-machine blade coater and expansion of the existing coating plant, two supercalenders, a new rewinder and salvage winder, a finished stock retrieval system, and expansion of sheeting capacity at the division's converting plant with fully automated roll storage. Plans are also in the making for the water quality center, which processes wastewater from three manufacturing divisions, to be expanded.

This is the company's largest expansion since beginning operations in 1904, a spokesman said. The last major paper machine expansion was completed in 1986 at the Biron Div. for $207 million. That 180,000-tpy machine produces lightweight coated (LWC) paper. Consolidated is also currently upgrading the 59,000-tpy LWC specialty paper machine at Stevens Point, Wis., at a cost of $110 million. These grades are used in food and consumer product packaging and labeling. Startup is scheduled for late 1990.

- Madison Paper Industries recently filed a site permit as a prelude to possible expansion of the Madison, Maine, supercalendered mill. Published reports said the company may add a new 170,000-tpy paper machine similar to the 175,000-tpy machine currently in operation. The project would cost around $300 million and include expansion of the pressurized groundwood pulp mill, the report said. Machine startup would be in July 1991.

However, the company is considering other sites should Maine not come through with certain incentives. The state recently passed investment tax legislation that would favor a capital investment such as this, sources said. A decision on whether or not to proceed may be made by the end of November. ■

Makin still attempting to launch mill project in 1991

Under new direction from former Nortek Forest Products Ltd. CEO Peter E. Von Sass, Makin Pulp & Paper Ltd. appears to be progressing in getting plans for the long-delayed Britannia Beach, B.C., 220,000-metric-tpy coated publication paper mill off the ground.

Von Sass said that construction would start in the fourth quarter. If all goes as currently expected, the estimated C$400-million greenfield mill would start up sometime in early 1991.

Von Sass, who helped put together Nortek's 100,000-tpy hardwood market pulp mill project, was named president of Makin in January. Makin has tried for several years to get its mill built, at first staking out a plot in Alberta and later transferring to the Britannia Beach site. Last year, the company was awarded timber rights by the province, and this summer it received the final agreement signed by British Columbia Forest Minister Dave Parker, noted Von Sass.

The mill will make coated Nos. 3 and 5 groundwood grades as well as uncoated printing/writing paper using the alkaline process, noted Von Sass. The primary end users will be magazine publishers and catalog and advertising insert printers on the West Coast.

A bleached chemi-thermomechanical pulp mill that will meet the paper machine's fiber requirements is also included in the project. In recent months, engineering design for the mill complex has been completed, and major equipment suppliers have been secured—primarily from Austria and Fed. Rep. Germany. ■

SALES AND EARNINGS

U.S. paper industry profit growth is slowing

Ending three years of double-digit growth, U.S. paper industry earnings rose 9.3% in the second quarter compared with a year earlier, according to a *P&P* survey of results from about 30 companies. This compares with a [illegible] jump in earnings in the first quarter and a 43% surge in profits for all of 1988, compared with the same levels a year ago.

The slowing momentum in earnings reflected softening markets for some printing/writing grades, serious price erosion in newsprint, and a relatively flat performance in containerboard, where producers have gone for more than a year without a price increase. (Just-released U.S. Commerce Dept. statistics show GNP growth slowed to 1.7% in second-quarter 1989.) Bleached market pulp and paperboard, however, remained strong. In a reversal from last year, those companies involved in wood products have been doing well thanks to rising lumber and plywood prices, which have been helped by declining interest rates and have curtailed production in the Pacific Northwest.

International Paper Co. recorded sales of $3 billion on a 22% increase in profits to $229 million. The company said 75% of its sales growth was due to recent acquisitions (Aussedat Rey, Ilford, Masonite). The company said that the strong showings of pulp, paperboard, and packaging businesses compensated for a softening in the uncoated white paper markets. IP noted that inventory work off of coated publication paper ebbed during the quarter, and by the end of the period, orders had returned almost to normal.

Georgia-Pacific Corp.'s 46% rise in earnings, to $172 million on sales of $2.6 billion, reflects strength in both paper and wood products operations. The company said that a six-day strike at five of its plywood plants in the South, which ended July 16, would have no effect on earnings in the current quarter.

Weyerhaeuser Paper Co.'s earnings rose 3% to $154 million on $2.6 billion in sales. Chairman and CEO George H. Weyerhaeuser said pulp and paper markets and pricing continue to be generally strong. Some discounting is occurring in newsprint

U.S. paper industry second-quarter results ($000).

Companies	Sales	Change 1989/88	Earnings¹	Change 1989/88
Badger Paper Co. Inc.	$19,475	9.3%	$1,201	[illegible]
Boise Cascade Corp.	1,091,380	6.4	76,290	4.2
Bowater Inc.	393,000	3.4	38,000	[illegible]
Champion International	1,290,000	2.4	113,274	1.5
Chesapeake Corp.	213,322	16.5	11,861	[illegible]
Consolidated Papers Inc.	236,458	7.6	42,821	[illegible]
Federal Paper Board Co.	306,789	24.4	51,556	78.2
Gaylord Container Corp.	193,000	2.7	10,900	−12.0
Georgia-Pacific Corp.	2,840,000	9.2	173,000	[illegible]
P.H. Glatfelter Co.	156,340	9.0	24,948	30.1
Great Northern Nekoosa Corp.	698,400	15.3	90,290	5.7
International Paper Co.	3,000,000	25.0	225,000	[illegible]
James River Corp.	1,843,211	17.6	74,232	[illegible]
Jefferson Smurfit Corp.	334,793	4.0	33,880	−7.3
Kimberly-Clark Corp.	1,396,000	4.1	101,300	1.2
Longview Fibre Co.	169,984	[illegible]	15,479	[illegible]
Louisiana-Pacific Corp.²	529,100	10.9	45,400	[illegible]
Mead Corp.	1,207,400	4.1	60,200	[illegible]
Mosinee Paper Corp.	59,330	−6.1	3,600	[illegible]
Pentair Inc.	302,928	49.0	16,332	[illegible]
Pope & Talbot Inc.	161,057	32.5	[illegible]	[illegible]
Potlatch Corp.	296,100	11.0	25,700	[illegible]
Scott Paper Co.	1,254,100	7.7	71,200	−5.0
Sonoco Products Co.	415,437	[illegible]	[illegible]	[illegible]
Stone Container Corp.	1,379,900	53.7	83,400	[illegible]
Temple-Inland Inc.	479,800	8.3	52,530	−0.4
Union Camp Corp.	711,774	7.9	81,429	[illegible]
Wausau Paper Mills Co.	63,109	7.8	5,050	[illegible]
Westvaco Corp.	561,711	6.3	56,125	[illegible]
Weyerhaeuser Paper Co.	2,643,986	8.0	134,893	[illegible]
Willamette Industries Inc.	491,831	15.5	47,673	[illegible]
Total	**$24,814,159**	**12.7%**	**$1,912,474**	[illegible]

1. Income after taxes, from continuing operations, excluding most significant nonrecurring items in both years.
2. Louisiana-Pacific's year-ago figures are restated to reflect the spinoff of Fibreboard Corp. in July 1988.

and other paper, while containerboard packaging markets are relatively stable.

A bitter pill. Stone Container Corp. reported an 18.6% decline in second-quarter profits. The earnings decline was blamed on the unsuccessful price increase, which also caused some loss of business, weakness in newsprint prices, and a "disproportionate level of downtime at certain mills, which represented over 200,000 tons of lost production."

Jefferson Smurfit Corp. reported a 7.3% decline in net income after taking a charge of around $3 million for early debt retirement related to its 50%-owned affiliate, Container Corp. of America. Smurfit has paid down all of the $650 million debt it incurred in buying its CCA stake in 1986.

Union Camp Corp. reported a 9.9% increase in profits for the second quarter. "Demand for linerboard and corrugated containers was healthy, and industry inventories remained low," noted Union Camp chairman and CEO Gene Cartledge.

Federal Paper Board Co. enjoyed a 78.2% increase in earnings, thanks to strong solid bleached sulfate markets. The company said the big jump was largely due to improved results from its Augusta, Ga., 1,200-tpd SBS mill.

Printing paper spotty. Almost all of the printing/writing paper producers said that the market for their products showed weakness in some areas during the quarter. Mead Corp. experienced a 15% decline in earnings and said some of its markets softened, but it expects demand to remain at current levels or slightly above for the rest of the year. Consolidated Papers Inc. reported that demand for lightweight coated paper is not as robust as it has been during the last few years, but the magazine and catalog publishing businesses continued to grow.

Tissue profits soften. Although the U.S. consumer tissue market in the second quarter was healthy, this was not reflected in the earnings of tissue producers because of weakness in unrelated products.

Scott Paper Co.'s earnings fell 5% in the second quarter. The company attributed this mainly to "higher pulp and other manufacturing costs, a difficult environment in Mexico, and slow progress in implementing our food service business strategy." Sales and earnings from its S.D Warren publishing paper division increased 5% and 3%, respectively.

Kimberly-Clark Corp.'s earnings inched up 1.2% to $101 million. K-C attributed this to "sharply lower" results from its newsprint operations. Results for its consumer tissue and disposable diapers businesses rose primarily due to higher selling prices.

James River Corp. said its profits for its fiscal year ending Apr. 30 amounted to $255 million, a 22% increase from the prior year. The company marked its twentieth year in business with sales of almost $6 billion, a 15% increase.

Wood products setting records. Pope & Talbot Inc. had a 63% rise in earnings. The company said its wood products sector had one of the best quarters in its history. Demand for lumber was strong, and prices for lumber and woodchips were high enough to help offset higher log costs. Willamette Industries Inc.'s profits rose 11%. Record plywood prices and strength in lumber and composite panel markets fueled the increase.

Boise Cascade Corp. reported a 4.2% increase in second-quarter profits, noting that a strong performance in building products helped offset weaker results from the company's paper and paper products operations. Louisiana-Pacific Corp. reported the best quarterly results in its history. ■

Canadian industry earnings continue downward spiral

Canadian pulp and paper industry profits continued their slide in the second quarter, dropping 19.1% on a 0.3% decline in sales from peak levels the industry enjoyed a year ago. The rising Canadian dollar (which recently topped the US85¢ level) and softening newsprint prices were the two main factors blamed for the earnings decline, which was partly offset by continuing strength in market pulp. Higher stumpage costs in British Columbia were also cited by several West Coast producers as a reason for the continuing profit decline. Noranda Forest Inc.'s earnings were off 16.9% on a 2.5% increase in sales to C$1.25 billion. The company said markets for most of its products, with the exception of newsprint, remained good during the quarter, although they "were clearly past their peak." Higher interest rates and the strong Canadian dollar also adversely affected earnings. Noranda said the year-earlier second-quarter results included a net gain of C$36 million from the sale of its investment in Polysar Energy & Chemical Ltd. The company's outlook for the rest of 1989 is positive, as operations are running close to capacity and markets for its products are remaining "generally firm."

MacMillan Bloedel Ltd., which is controlled by Noranda, posted profits of C$68.3 million, down 27.7% from second-quarter 1988, on a 1.2% increase in sales to $862 million. President and CEO Ray Smith attributed the decline to a stronger dollar and higher costs in British Columbia and said, "Although earnings will not reach the levels of 1988, the company expects a solid performance for the year." Increases in pulp prices and higher earnings from the Japanese market due to an increase in lumber prices and volumes helped to offset the drop in newsprint prices.

Abitibi-Price Inc. reported a profit of C$28.8 million on sales of C$830 million—down 47.1% and 0.7%, respectively, from the same quarter last year. Abitibi, the largest newsprint producer, cited current newsprint prices—which now range from about US$550 to $560/metric ton in the East—and the stronger Canadian dollar as the main reasons for its sagging profits. Chairman and CEO Bernd K. Koken said the company's printing paper group experienced lower operating profits as a result of softening markets, rising kraft pulp costs, and a stronger Canadian dollar. He said the group is expected to pick up later this year as a result of "great improvement in the coated paper division."

Canadian Pacific Forest Products Ltd. experienced a decline in both earnings and sales for the quarter, dropping 1.9% and 1.6%, respectively. Once again the company attributed the loss to the newsprint market and currency appreciation. "Positive factors were improved prices and increased shipments of market pulp," said Cecil S. Flenniken, chairman, president, and CEO.

Domtar Inc.'s pulp and paper products group more than doubled profits from second-quarter 1988. This contributed to the 4.2% increase in earnings and 7.1% rise in sales for the company overall. According to the company, the improvement reflects the ability of the Quevillon, Que., mill to capitalize on strong market conditions after the 1988 labor strike, as well as the favorable contribution of the Windsor, Que., mill. Domtar's packaging group posted lower earnings, which reflects weaker market conditions for corrugated containers and the impact of the stronger Canadian dollar.

Another victim of the bloated newsprint market in the second quarter was Fletcher Challenge Canada Ltd. Company profits sank 27.4% on a 6.9% drop in sales to C$366 million. Chairman and CEO Ian Donald also blamed the stronger Canadian dollar and poor wood products markets in North America for this decline. 'The market for newsprint has eased somewhat, but the most significant impact on our first-half results was the increase in the value of the Canadian dollar, which has strengthened 5¢ on its U.S. counterpart to 84¢ up from 79¢ a year ago." ■

Canadian paper industry second-quarter earnings (C$000).

Company	[illegible] Sales	Change 1989/88	Earnings¹	[illegible]
Abitibi-Price Corp.	$830,000	−0.7%	$28,800	−47.1%
Canadian Pacific Forest Products Ltd.	[illegible]	−1.6	72,800	−1.9
Canfor Corp.	222,200	−20.5	25,700²	−13.2
Crestbrook Forest Industries Ltd.	88,910	6.8	9,088	18.4
Domtar Inc.	822,000	7.1	28,000	4.2
Donohue Inc.	162,200	4.3	10,900	−40.4
Fletcher Challenge Canada Ltd.	366,000	−6.9	35,900	−27.4
MacMillan Bloedel Ltd.	862,000	1.2	68,300	−27.7
Noranda Forest Inc.	1,250,000	2.5	59,000²	−16.9
Repap Enterprises Corp. Inc.	274,900	10.1	22,100	−3.8
Rolland Inc.	114,500	4.6	(155)	−119.4
Scott Paper Ltd.	78,270	−0.7	3,022	−28.8
Tembec Inc.	85,826	9.5	10,592	20.8
Weldwood of Canada Ltd.	188,900	−21.3	16,000	−21.0
Total	$5,322,105	−0.3%	$386,745	−19.1%

1. Income after taxes from continuing operations, excluding most significant nonrecurring items in both years.
2. Canfor's year-earlier figure restated to reflect a $68.5-million gain on the sale of certain assets. Noranda's year-ago figures restated for an accounting change.

LINERBOARD

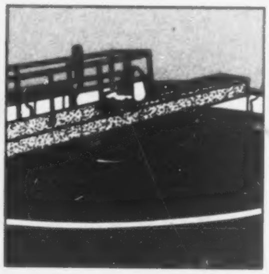
Kenaf of North America to build 750-tpd recycled mill

Kenaf of North America Inc. announced that it plans to build a greenfield 100% recycled linerboard mill in Muskogee, Okla., at a cost of $130 million. The new mill will come onstream in late 1991. It will make high-performance liners, white-top linerboard, and mottled white linerboard along with the standard liner grades, the company said. Most of the output is expected to be sold to independent converters.

Inland Container Corp.'s 575-tpd mill in Ontario, Calif., is currently the largest 100% recycled linerboard mill in the U.S. That mill started up in late 1985 and also cost $130 million to build. Kenaf of North America noted in its press release that the Greater Muskogee Development Corp., a nonprofit group, "provided early assistance in financing a marketing study and has provided later assistance in the form of financing and a favorable price for the site of the mill." According to reports, Llama Co., Fayetteville, Ark., has been retained as investment banker. A company spokesman said that Kenaf had negotiated a good construction contract, and he believes that $130 million is a fair price for the mill.

PULP MILLS IN U.S. WILL HAVE TO MEET LIMITS ON DIOXIN DISCHARGES BY 1992

Under Section 304L of the Clean Water Act, kraft pulp mills will be required to reduce dioxin levels in receiving streams to 0.013 ppq



By REGINA McGRATH, News Editor

Eighty-eight of the 104 bleached kraft mills in the U.S. have been put on the short list under Section 304L of the Clean Water Act because of trace amounts of dioxin in their effluent, according to the Environmental Protection Agency. This means that most kraft pulp mills in the country will have to meet specific limits on dioxin discharges in their effluent by June 4, 1992.

Boise Cascade Corp.'s mill in International Falls, Minn., was the first pulp and paper mill in the U.S. to be issued a final effluent permit that contains a dioxin limit, according to EPA Region 5. The permit requires the mill not to exceed a daily level of 10 ppq (parts per quadrillion) of 2,3,7,8-TCDD in its effluent after its expansion is completed. (Ten ppq is the lowest level to which technology can measure.)

As reported, EPA Region 1 has issued draft effluent permits that contain dioxin limits to four mills in the Northeast (*P&P*, May 1989, p. 31). A spokesman for Region 1 said recently that the companies involved made a "very significant, well-presented reaction to the draft permits." He said that the comment from James River Corp., Berlin, N.H., contained a mathematical model for dioxin uptake for site-specific use that was developed by a contractor hired by the National Council of the Paper Industry for Air & Stream Improvement (NCASI). This model reportedly is able to take into account the effects of a specific mill's effluent discharge on the actual receiving stream, what kind of fish are in the receiving water, how easy it is to fish there, and other factors that could obviate the need to obtain the low levels of the draft permits. (The draft permit for James River's Berlin mill limits dioxin discharges in toxic equivalents to 0.4 ppq.) It is probable that NCASI will offer the model for use to member companies of the American Paper Institute.

In contrast, EPA is using its ambient water quality standard for dioxin in streams of 0.013 ppq and working backward from that to write the dioxin limits in discharge permits.

A lot of sticky questions, many of them legal rather than technological, have to be answered about dioxin regulations. Paper companies are having their legal staffs review the permits. While the states are being told to write NPDES permits to comply with Section 304L of the Clean Water Act by 1992, EPA, under a consent decree, is supposed to determine by April 1990 whether or not dioxin in effluent needs to be regulated.

Separately, EPA's Office of Water has said it plans to revise the best-available-technology guidelines by 1993 to include dioxin, furans, and possibly other chlorinated compounds. These conflicting deadlines make it difficult for the states to proceed with permitting. There is also the question of why some states listed their mills on the 304L short list and why others did not.

FISH NEAR MILLS CONTAMINATED. As of late spring, EPA's National Bioaccumulation Study found chlorinated dioxins and/or furans in fish tissue near 83 of 96 pulp and paper mills surveyed that use chlorine to bleach pulp. Because of the finding, EPA has recommended to states that they develop individual control strategies for every mill where 2,3,7,8-TCDD is detected in fish, unless a state-adopted numeric water quality criterion for this dioxin is not being violated. This is problematic because states may not be able to determine if a violation is occurring because technology cannot measure to such low levels.

API and the National Forest Products Assn. have written to EPA's Office of Water to express their concerns with this policy. The Bioaccumulation Study is monitoring the presence of 67 highly bioaccumulative pollutants in fish at 400 sites in the U.S., including the 104 mill sites. Preliminary comparisons indicate that dioxin is generally higher in fish from sites near kraft pulp mills than from other sites.

DATA IN FROM 104 MILLS. The testing for trace levels of dioxin in pulp, effluent, and sludge under the joint EPA/API 104-mill study has been completed for the kraft pulp mills. Samples from the sulfite mills presented analytical difficulties and took longer to analyze. EPA reported that preliminary results from the study indicate that dioxin may be detectable in about 80% of the mills' effluents (Table 1). Pulp tests reveal the presence of dioxins and furans at levels ranging from undetectable to 311 ppt. The study does not detail the specific paper products made from pulp produced at the various mills—information that environmental groups, such as Greenpeace, believe should be available to consumers.

TABLE 1: **U.S. EPA/paper industry cooperative dioxin study preliminary data for dioxin in mill effluent.**

Mills (by state)	2,3,7,8-TCDD concentration in effluent (ppq)
Container Corp. of America, Brewton, Ala.	6.5
James River Corp., Butler, Ala.	23.0
Alabama River Pulp Co., Claiborne, Ala.	42.3
Kimberly-Clark Corp., Coosa Pines, Ala.	35.0
Champion International, Courtland, Ala.	77.0
Gulf States Paper Corp., Demopolis, Ala.	38.0
Boise Cascade Corp., Jackson, Ala.	107.5
International Paper Co., Mobile, Ala.	n.q.
Scott Paper Co., Mobile, Ala.	14.0
International Paper Co., Selma, Ala.	81.0
Nekoosa Papers Inc., Ashdown, Ark.	41.0
Georgia-Pacific Corp., Crosset, Ark.	96.0
Potlatch Corp., McGehee, Ark.	40.0
International Paper Co., Pine Bluff, Ark.	110.0
Stone Container Corp., Snowflake, Ariz.	5.5
Simpson Paper Co., Anderson, Calif.	250.0
Gaylord Container Corp., Antioch, Calif.	49.0
Simpson Paper Co., Fairhaven, Calif.	100.0
Louisiana-Pacific Corp., Samoa, Calif.	n.q.
Champion Papers, Cantonment, Fla.	11.0 n.d.
Georgia Pacific Corp., Palatka, Fla.	16.0
Stone Container Corp., Panama City, Fla.	7.6 n.d.
Buckeye Cellulose Corp., Perry, Fla.	27.0
St. Joe Paper Co., Port St. Joe, Fla.	21.0
Federal Paper Board Co. Inc., Augusta, Ga.	16.0
Brunswick Pulp & Paper Co., Brunswick, Ga.	30.0
ITT Rayonier Inc., Jesup, Ga.	23.5
Buckeye Cellulose Corp., Oglethorpe, Ga.	12.0 n.d.
Gilman Paper Co., St. Marys, Ga.	6.5 n.d.
Potlatch Corp., Lewiston, Idaho	75.0
Willamette Industries Inc., Hawesville, Ky.	11.0 n.d.
Westvaco Corp., Wickliffe, Ky.	35.0
International Paper Co., Bastrop, La.	330.0
Boise Cascade Corp., DeRidder, La.	9.2
James River Corp., St. Francesville, La.	82.0
Georgia-Pacific Corp., Zachary, La.	190.0
Westvaco Corp., Luke, Md.	16.0
Scott Paper Co., Hinkley, Maine	17.5
Lincoln Pulp & Paper Co. Inc., Lincoln, Maine	32.0
James River Corp., Old Town, Maine	39.0
Boise Cascade Corp., Rumford, Maine	120.0
Scott Paper Co., Westbrook, Maine	6.3
Georgia-Pacific Corp., Woodland, Maine	6.8
Mead Corp., Escanaba, Mich.	17.0 n.d.
Scott Paper Co., Muskegon, Mich.	8.4 n.d.
Champion Papers, Quinnesec, Mich.	9.0
Potlatch Corp., Cloquet, Minn.	24.0
International Paper Co., Moss Point, Miss.	160.0
International Paper Co., Natchez, Miss.	38.0
Leaf River Forest Products Inc., New Augusta, Miss.	200.0
Stone Container Corp., Missoula, Mont.	3.1
Champion Papers, Canton, N.C.	n.q.
Weyerhaeuser Paper Co., New Bern, N.C.	44.0
Weyerhaeuser Paper Co., Plymouth, N.C.	320.0
Federal Paper Board Co. Inc., Riegelwood, N.C.	n.q.
James River Corp., Berlin, N.H.	59.0
International Paper Co., Ticond[illegible], N.Y.	21.0
Pope & Talbot Inc., Halsey, Ore.	30.0
Boise Cascade Corp., St. Helens, Ore.	22.0
International Paper Co., Erie, Pa.	24.0
Appleton Papers Inc., Roaring Spring, Pa.	11.0 n.d.
P.H. Glatfelter Co., Spring Grove, Pa.	8.4 n.d.
Bowater Carolina, Catawba, S.C.	24.0
Union Camp Corp., Eastover, S.C.	20.0
International Paper Co., Georgetown, S.C.	565.0
Bowater Southern, Calhoun, Tenn.	6.8 n.d.
Mead Corp., Kingsport, Tenn.	6.0
Temple-Eastex Inc., Evadale, Texas	n.q.
Champion Papers, Houston, Texas	n.q.
Simpson Pasadena Paper Co., Pasadena, Texas	n.q.
International Paper Co., Texarkana, Texas	15.5
Union Camp Corp., Franklin, Va.	68.0
Chesapeake Corp., West Point, Va.	16.0
James River Corp., Camas, Wash.	n.q.
Weyerhaeuser Paper Co., Everett, Wash.	33.0
Longview Fibre Co., Longview, Wash.	4.6 n.d.
Weyerhaeuser Paper Co., Longview, Wash.	9.2
Simpson Tacoma Kraft Co., Tacoma, Wash.	n.q.
Boise Cascade Corp., Wallula, Wash.	360.0
Wausau Paper Mills Co., Brokaw, Wis.	4.2 n.d.
James River Corp., Green Bay, Wis.	9.7 n.d.
Nekoosa Papers Inc., Port Edwards, Wis.	40.0
Pentair Inc., Park Falls, Wis.	5.4 n.d.
Badger Paper Mills Inc., Peshtigo, Wis.	7.1
Weyerhaeuser Paper Co., Rothchild, Wis.	12.0

n.d. = Not detected. In these cases the value reported is the detection limit.
n.q. = Not quantified. Lab analyses are being rerun for these samples.
Note: Where more than one value was given, *Pulp & Paper* averaged the values unless they were too divergent to be meaningful.
Source: Environmental Protection Agency and the America Paper Institute.

. . . there is a divergence of opinion on how to express risk and on the validity of testing protocols . . .

EPA is planning to present the findings from the 104-mill study Sept. 17-22 at the International Dioxin Symposium to be held in Toronto, Ont. It will also place a notice in the *Federal Register* (probably this month) alerting the public that the results are available. The bound report will probably come out next spring, a spokeswoman for EPA said. This is about the same time that the Office of Toxic Substances will have its risk assessments done. It is probable that next spring, hearings on dioxin pollution will reconvene.

Meanwhile, the Office of Technology Assessment, which works for Congress, has issued a report entitled "Technologies for Reducing Dioxin in the Manufacture of Bleached Wood Pulp."[1] The 74-page report is a good review of the studies on dioxin conducted so far and possible methods to reduce dioxin discharges. OTA recognized what those in the industry have known all along: there is no silver bullet for reducing TCDD and TCDF in bleached pulp. Instead, several technologies and/or process modifications may be used individually or in combination:

- Extend delignification of pulp before bleaching.
- Improve brownstock washing.
- Substitute nonchlorinated bleach agents.
- Substitute chlorine dioxide for some or all of the chlorine.
- Apply multiple additions of chlorine in split charges instead of a single massive charge.
- Improve chemical mixing with the pulp.
- Adjust the acidity of the unbleached stock before adding chlorine.
- Use cleaner oil-base defoamers.
- Remove dioxin precursors prior to the addition of chlorine.
- Improve secondary waste treatment and disposal.

CONSUMER SAFETY. Because of the lack of published independent government research on the risks associated with dioxin in paper and mill worker exposure, OTA said it had to rely almost wholly on industry-sponsored research. One of the chief concerns of environmental groups is that NCASI's risk assessments failed to consider the cumulative risk of using a wide range of paper products daily. They also feel a risk assessment should take into account the potential risks from the several hundred other chlorinated byproducts that are found in paper products. In a hearing held in November 1988, OTA found that there is a divergence of opinion on how to express risk and on the validity of testing protocols for determining the rate of migration of dioxin from paper products to the body.

To address these concerns, EPA established an Interagency Task Force on Dioxin that includes the Food & Drug Administration plus the Consumer Products Safety Commission. The group will try to determine if a risk exists, based on the 104-mill study and estimates of migration rates. It also will include an assessment, based on product use scenarios, of technologies that could reduce dioxin exposure.

A spokesman for FDA said that a draft report of the tests on milk before and after it is packaged in solid bleached sulfate (SBS) cartons exists and the data are being reviewed. He said that the data would ultimately be made public but could not say when. The data will be turned over to EPA in October as part of FDA's summary of the risks associated with various food packaging products. The analysis of milk was supposed to have been completed by Apr. 1, 1989 (*P&P*, April 1989, p. 135).

As reported, Canada is in the midst of a nationwide test of milk packaged in SBS cartons (*P&P*, May 1989, p. 33). This came as a result of a test conducted in Quebec on 140 milk samples that found trace levels of furans in milk packaged in SBS cartons. Suppliers of milk cartons made out of bleached board have committed to supplying to Canada SBS board that does not result in any detectable level of dioxin in milk.

A study conducted during March and April of this year by the Dept. of Health in New Zealand found that unpackaged milk and milk packaged in glass or plastic contained "virtually undetectable" levels of dioxin.[2] The tests showed that dioxin leached from the paperboard cartons into milk and cream in the range of 0.012 to 0.216 ppt for standard homogenized milk (16 samples), 0.130 to 0.263 ppt for skim milk (four samples), and 0.138 to 0.432 ppt for cream (four samples). The study found that although these levels of dioxin equivalents are not considered to be a health risk, they contribute to the body burden of dioxin. The paperboard packaging industry in New Zealand has provided new packaging, and levels of dioxin in milk are being monitored.

Meanwhile, the National Institute of Occupational Safety & Health is conducting a health hazard evaluation of mill workers exposed to dioxin and other chlorinated organics in normal mill operations (*P&P*, April 1989, p. 136). NIOSH has visited mills to determined where exposure could happen. Its funds are limited, and each blood test would cost about $1,000 to $1,200, so it will initially test people most likely to be exposed. ■

REFERENCES

1. The OTA report can be ordered for $3.75 from the Government Printing Office (stock number 052-003-01154-9), Washington, D.C. 20402-9325.
2. This study can be ordered from Health Protection Program, Dept. of Health, P.O. Box 5013, Wellington, New Zealand.

INFLUX OF ENTRY-LEVEL ENGINEERS DROPS MEDIAN INCOME TO $52,000

Slight decline from 1988 salary level can also be attributed to increased retirement of veteran employees and the industry's push for new engineers

By KELLY H. FERGUSON, Projects Editor

Despite record profits in the pulp and paper industry during the past year, professional salaries appear to have declined slightly, based on *Pulp & Paper*'s 1989 salary and opinion survey. However, this decline in median income—to $52,000 in 1989 from $53,000 in 1988—is probably due to an increasing number of newer employees in the industry and the retirement of some older employees.

While the majority of respondents were more than 40 years old (50.3%), the largest increase in age categories came from the 30 and under age group. Another factor that suggested a possible increase in younger engineers is that 39.2% of respondents said they have been with their present employer only five years or less. In actual number of years, 11.4% of the respondents said that they have been with their current employer one year or less.

BACKGROUND OF SURVEY. *P&P*'s fifth annual survey is based on responses to a questionnaire included in the May 1989 issue. Information from the returned forms was processed by an independent data processing firm according to *P&P*'s specifications. Data from 1989 are compared with data from our 1988 survey to provide readers with perspective on changes in compensation, benefits, and employee attitudes. This comparison should give an indication of personnel trends in the industry at the peak of capacity and capital spending.

The report is designed to compare the progress of engineers in the paper industry, on the supplier and consulting side as well as in primary manufacturing, with professional peers in various other disciplines. In addition, the report also compares the salaries of specific engineering types and functions within the paper industry.

TABLE 1: **Salary distribution of all respondents.**

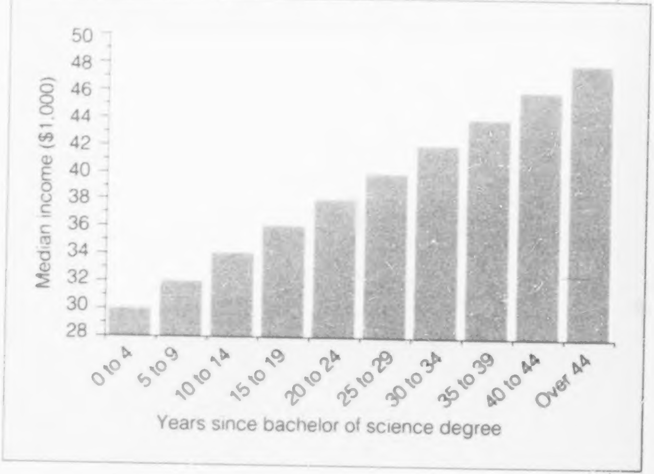
	Salary ($1,000)		
	1989	**1988**	**% change 1988-89**
Lower decile	33	35	−6
Lower quartile	41	42	−2
Median	52	53	−2
Upper quartile	65	66	−2
Upper decile	79	85	−8

AN OVERALL PROFILE. Respondents' median income decreased 2% from 1988, but the largest decreases came

TABLE 2: **Benefits of respondents.**

	% of respondents	
Benefit	**1989**	**1988**
Medical insurance	98.7	92.8
Life insurance	94.7	89.8
Retirement pension plan	88.9	83.8
Dental insurance	84.4	78.5
Education allowance	49.9	47.2
Stock option plan	41.4	39.5
Profit sharing	36.8	37.1
Bonus plan	33.7	31.8
Travel budget	28.0	24.7
Company car	13.1	12.2

FIGURE 1: **Income and professional experience.**



On Reader Service Card **Circle 207** For Mount Vernon Wet Felts or **208** For Mount Vernon Forming Fabrics.

Reader opinions

Pulp & Paper's salary survey asked readers for comments on their jobs, companies, or the industry. Opinions focused mainly on salaries and benefits, problems with management, and reasons for low morale. Also, a number of respondents commented on the current trend of the "team concept" and quality improvement. Comments have not been edited for content (only grammar and style as necessary) in order to retain their originality. The following were chosen as typical of responses received.

"My company continues to struggle to make a quality product, but production and ROI [return on investment] still dominate mill decisions. The gulf between top management and middle-level management continues to widen. They pat themselves on the back and give themselves big raises and profit-sharing programs, while middle-level supervisors and engineers are expected to be satisfied with more work and below-inflation-level raises."

—engineering/Northwest

"As with most jobs in this mill, communication between departments is terrible."

—production/Northeast

"The paper industry—as is American industry in general—is driven by the short-term profit picture, as controlled by the investment community, which collectively is ruining American industry."

—production/Midwest

"U.S. quality is a myth."

—administration/Northwest

"Leveraged buyouts are ruining our nation—creating a lot of 'fat cats' and unemployed workers!"

—technical service/Midwest

"Private-sector employees have no idea how hard their counterparts in the federal government work. Much preparation and effort is needed in representing the U.S. paper industry's concerns in international circles."

—R&D/East

"Profit sharing is necessary if we are serious about employee involvement and changing behavior and the U.S. business culture."

—quality control/Southeast

"It is hard to prove my value to the company. I started young and have had to work hard to change management's opinion of me as I have grown. This is frustrating and affects my morale."

—maintenance/Northeast

"This company cares far greater for equipment welfare and maintenance than for any of the employees."

—engineering/Southeast

"Corporations are not putting resources into their youth, giving you no other choice but to look for a new job."

—sales/Northeast

"I love being in business for myself. I highly recommend it."

—consulting/Northeast

"I have found paper company management to be very archaic, heavy handed, and resistant to change."

—R&D/Northeast

"I work with a socio-technical system. We have a 'pay for knowledge' system. The vision is to eventually (in five to eight years) have self-reliant teams."

—production/Midwest

"Engineers, in general, are not paid enough or treated professionally. We need a union!"

—consulting/Southeast

"Management: I've yet to have a good manager. Most are engineers who don't know how to manage or just don't care. And the company I work for doesn't offer any management training. As a result, morale is low. There isn't a team feeling—work isn't done productively.

"Working conditions: 400 of us are crammed into a large room with no partitions, and upper management—sitting in their nice, big, quiet offices—wants no socializing. What do they expect? Engineers are treated not like professionals but like school children.

"Discrimination: Men in my company are paid considerably higher than women, and respect and promotions for women are hard to come by. Also, if men are talking to one another or on the phone, they are 'networking' or conducting business. If it's a woman, they are 'gossiping' or 'socializing,' though it isn't necessarily true. We have no women in management positions."

—sales/male/Northeast

"With the record profits my company is making, they sure are not sharing them with any of the workers—salary or union. I think they are out of touch with the real world and inflation."

—production/Northwest

"Companies appear to be getting rid of older employees. The young are taking over."

—engineering/Southeast

"One hundred percent travel, as required in corporate engineering, is really tough. And its undervalued by my upper management."

—engineering/Midwest

"My job is not satisfactory because there is no opportunity for advancement. Frankly, I feel that anyone with a forestry background from a rural southern state has little chance of being considered for anything other than land management or wood procurement.

I went back to school for my MBA, and that has not opened any doors. This is not true for engineers, accountants, wood technologists, etc. I intend to stay with this company long enough to fulfill my obligations for the educational reimbursement and then look elsewhere.

I certainly don't plan to look only in the paper industry because there is little opportunity for advancement."

—production/Southeast

"Companies need to circulate lists of job openings to help career planning. They also need to rotate job performance evaluators."

—maintenance/Southeast

"Company's performance/merit review is ludicrous—everyone gets the same raise regardless of their performance."

—production/Midwest

"The most important benefit is a retirement plan."

—consulting/Southeast

"After having worked in two industries for three corporate employers, I have come to the belief that salaries are determined by employee age more than any other factor, and that raises are based more on bargaining unit (union) contracts than any other factor."

—engineering/Southeast

"I'm underpaid as a woman vs a man in the same position."

—quality control/Southeast

"There should be laws to force companies to plant one tree for every tree cut, with close supervision for compliance."

—consulting/Canada

"With record profits in the pulp and paper industry, it's time that some money is spent on improving the overall image—become more professionally managed to attract the cream from schools/colleges."

—technical service/Northeast

"Working for this industry beats a poke in the eye with a sharp stick, but not by much."

—consulting/Southeast

"Almost no women in the industry."

—public relations/North

"I like my job, my company, and my industry in general. However, my morale would be much higher if we would stop restructuring for a minute or two."

—management information service/Midwest

"Many decisions are made by upper management, even when they know little about the subject."

—engineering/Michigan

"I'd like to see a technical pay scale that would match the management pay scale."

—engineering/Midwest

"Accountants and executives are making the future bleak for us."

—production/Midwest

"There should be proper recognition of service departments. All mills need very reliable water supply, power and steam supply, and waste treatment."

—environmental control/Northeast

"This industry suffers from world economy swings. Also, high-tech growth is not uniform. When engineering and technology has reached the twenty-first century, operator skills lag behind 15 to 20 years."

—engineering/Southeast

"Coming from another industry, I am surprised that such a large industry can have such a low public profile."

—technical/Canada

"I have found that I've earned more money by changing jobs than by staying with the same company. I also have a position with more responsibility."

—technical service/Northwest

"Pulp and paper employers need to adjust to the changing employee climate in respect to flexible working hours, two career families, and a more technology-oriented work force."

—engineering/Midwest

"The best job in the pulp and paper industry is in R&D. Manufacturing, where I came from, has a long way to go to catch up. My ten years in manufacturing were a nightmare. I wouldn't change my job in R&D for a million dollars in manufacturing."

—R&D/Northeast

"Finally, salaried employees are gaining ground on the hourly work force. Recent contracts containing first-year bonuses plus 2% to 3% raises in later years have made our 4% to 6% raises look good. However, these raises seem relatively small in comparison to corporate profits during the last three years. When pulp and paper markets soften (as they surely will), I wonder if our raises will disappear."

—technical service/Southeast

"I enjoy the paper industry—just struggling with this mill!"

—engineering/Midwest

"Executive greed is rampant in the corporation I work for."

—R&D/Midwest

"The company uses a 'we don't need you' attitude and a 'scream in the face' attitude. They seem to want the employees agitated."

—production/Northeast

"I wish there was a better way to get ahead other than playing politics and/or back-stabbing."

—maintenance/Southeast

"The paper industry is the best of all."

—production/Northeast

"I wish I had less meetings and more working time."

—technical service/Northeast

"Our management is very old-fashioned and too layered. I can't make any decisions without checking with my boss, who checks with his boss, who checks with his boss."

—engineer/Southeast

"The pulp and paper industry is an excellent choice for engineering professionals looking for a rewarding career. I came to this industry from the oil industry, and the difference is tremendous. I would rather work in an industry tied to consumer spending than to the price of oil."

—production/Southeast

"My company is flattening the organization. Now only MBAs go up. The rest of us have to work harder, for less pay and a poor future, and like it or get out."

—sales/Southeast

"People, especially upper management, need to change their attitudes. They need to realize the importance of good workers, job morale, etc. It would be best if people quit their unions and became real company people. Unions will be the demise of this industry."

—consulting/Northeast

"Despite a record year for profits, the company is freezing salaries and cutting benefits, creating an atmosphere of uncertainty, which has caused low morale."

—production/Northeast

"We need more qualified people."

—sales/Midwest

from the lower decile (-6%) and the upper decile (-8%), representing the lowest and highest levels paid to respondents (Table 1). These decreases also give some indication that age groups are shifting within the industry—new employees would receive entry-level salaries, while retirement would cut out some of the higher-paid respondents.

Pulp and paper companies have grown during the year, with a 4% increase in companies having more than $2 billion in annual sales (42.7% in 1989 compared with 38.8% in 1988). Just as last year, most respondents (89.9%) liked their jobs, and 85.3% said they would stay in the paper industry if they changed jobs.

More women responded to the 1989 survey—7% compared with 4.1% in 1988. Also, possibly reflecting the industry's continuing shift southward, 39.7% of respondents live in the Southeast, 22.8% live in the Midwest, and 15.3% live in the Northeast. Other averages for respondents include the following: has a bachelors degree (59.6%), works for a wood products/pulp and paper manufacturer (65.5%) in either production/mill operations (18.1%), technical service/quality control

TABLE 3: **Income and type of employment organization.**

	Income ($1,000)					
Employing organization	**Lower decile**	**Lower quartile**	**Median**	**Upper quartile**	**Upper decile**	**% change in median 1988-89**
Academic	65	65	36	69	69	−53
Government	45	48	36	69	90	+16
Wood/pulp/paper—engineering	31	39	50	63	74	−12
Wood/pulp/paper—manufacturing	34	42	51	71	80	+2
Consulting firm	37	48	65	71	83	+8
Self-employed consultant	40	46	66	80	100	−6
Wood/pulp/paper—supplier	36	43	53	63	78	−13
Wood/pulp/paper—converter	30	39	50	70	85	−6
Other	27	40	55	65	85	−2

TABLE 4: **Income and principal work function.**

	Income ($1,000)					
Principal function	**Lower decile**	**Lower quartile**	**Median**	**Upper quartile**	**Upper decial**	**% change in median 1988-89**
Administration	37	48	65	85	110	−6
R&D	31	40	53	66	77	+13
Consulting	35	50	61	75	100	−5
Engineering design	34	42	51	64	72	−6
Teaching/academic	26	26	30	69	69	−45
Product development	40	45	60	68	82	+7
Production and mill/plant operation	36	43	53	66	80	+2
Engineering/maintenance	34	40	48	57	65	−6
Sales and marketing	35	42	53	65	79	−9
Technical service/quality control	31	36	45	55	64	+2
Other	32	40	50	61	85	−2

TABLE 5: **Income and level of supervisory management.**

	Income ($1,000)					
Supervisor responsibility	**Lower decile**	**Lower quartile**	**Median**	**Upper quartile**	**Upper decile**	**% change in median 1988-89**
None	30	34	41	51	64	−7
Indirect or staff	31	38	46	58	71	0
Team or unit	34	40	48	57	66	−2
Project or section	36	45	53	64	72	−2
Major department or division management	41	52	63	77	92	0
Corporate management of organization	40	55	79	110	121+	−21

(15.6%), or engineering design (15%).

Chemical engineers still make up the largest percentage of bachelor degrees in the industry (17.3%), and business degrees remained almost the same as last year (16.7%). Other degree distributions include mechanical engineering (15.4%) and paper science and technology (13.5%).

Job stability declined 2% since 1988, with 20% having changed employers in the last three years. Of those who have changed employers, 85.2% changed only once. Other statistics include the following:

Compensation:

- Respondents received an average of three salary increases in the past three years (the 1988 survey showed only two salary increases, indicating that because of record profits in the industry, increases have been more frequent).
- The last pay increase was 5% (a 1% decrease from 1988's survey).
- Eleven paid holidays and three weeks of vacation are taken yearly.
- Most salaries are reviewed annually (91.8%) and are based on merit/performance (52.1%), cost of living (4.9%), or both (28.7%).
- 85.1% are not paid overtime.
- 47.4% have not been promoted in the past three years, while 37.9% have been promoted once.

Personal:

- 97.1% of respondents work full-time; 1.9% are self-employed.
- The average respondent's work experience since leaving school is between 15 and 19 years.
- 86.4% of respondents have some kind of manage-

FIGURE 2: **Income and number of years with current employer.**

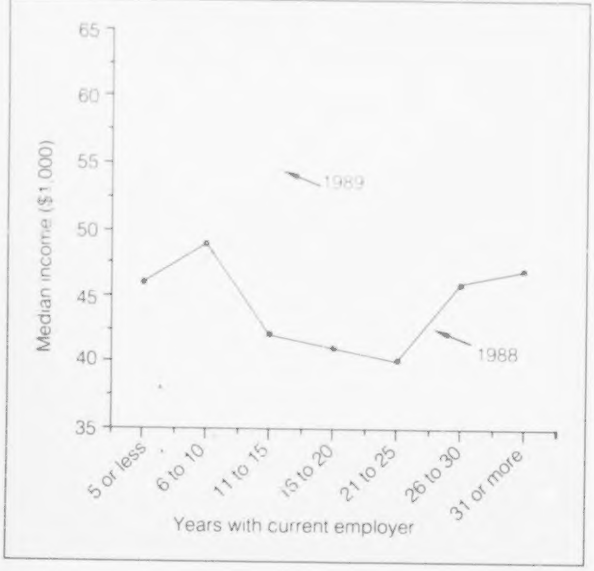


FIGURE 3: **Income and type of wood/pulp/paper company, all respondents.**

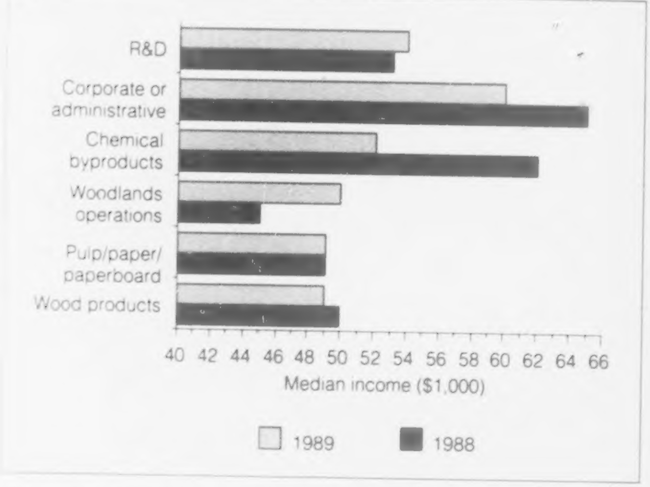


FIGURE 4: **Income and number of employees managed, all respondents.**

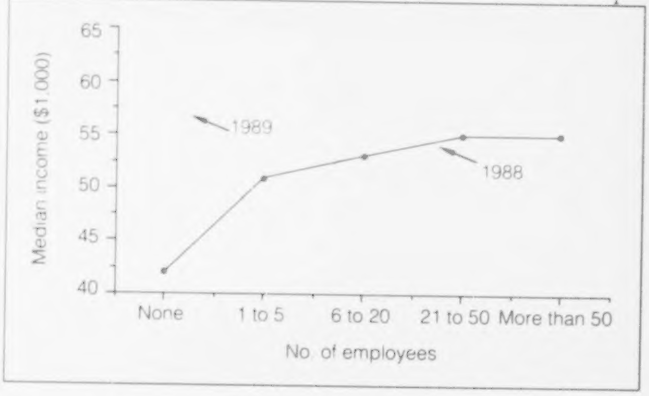
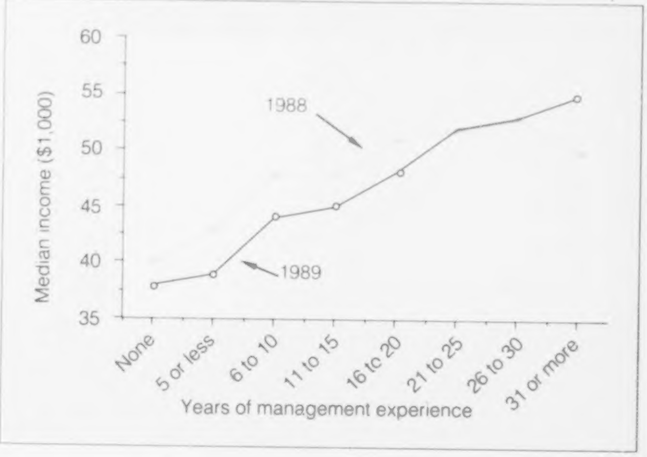


FIGURE 5: **Income and number of years of management experience, all respondents.**



ment responsibility.

- 26% have advanced degrees.
- 38% came from another industry.

Morale:

- 83.5% say their company listens to them and values their experience.
- On a scale of 1 (bad) to 5 (good), 50.9% ranked their job morale as above average (4), and 29.1% ranked their job morale as a 5.

ANALYZING EFFECTS ON INCOME. Tables 1 through 7 and Figures 1 through 8 present survey findings on compensation that compare a number of variables, including degree, discipline, work type and experience, type of employing organization, and supervisory level. Income figures in all tables were obtained by adding any bonuses or additional income reported by respondents to their reported gross salaries.

Table 2 shows that, except for a slight decrease in the

FIGURE 6: **Income distribution of respondents.**

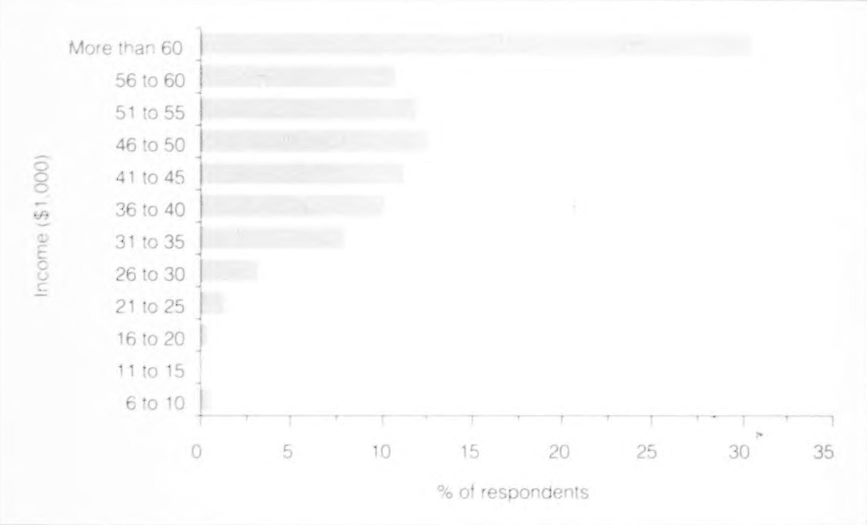


TABLE 6: **Income and educational field (bachelor's degree only), all respondents.**

Discipline	Income ($1,000) Lower decile	Lower quartile	Median	Upper quartile	Upper decile	% change in median 1988-89
Forestry/agriculture	34	46	57	70	94	+2
Chemistry	36	43	51	61	75	−6
Mechanical engineering	35	42	52	67	78	−7
Chemical engineering	33	40	50	65	76	−6
Electrical engineering	39	44	56	65	72	--
Industrial engineering	38	46	56	63	75	--
Mathematics/physics	33	39	53	72	100	−4
Computer science	35	38	37	80	117	−26
Biology/life science	28	28	51	47	47	NA
Paper science and technical	32	38	38	55	68	−22
Environmental science	36	36	44	49	49	−21
Business	30	37	52	68	80	−9
Liberal arts	26	35	39	52	60	−26
Other	29	37	17	62	69	−70

TABLE 7: **Effect of educational field and experience on income (bachelor's degree only).**

Discipline	Median income ($1,000)	Median YSB[1]	% of respondents with YSB[1]<10	Income rank	Experience rank	Median income/median YSB[1] ($1,000/year)
Forestry/agriculture	58	19	10.8	1	2	3.1
Chemistry	50	21	19.2	4	1	2.4
Mechanical engineering	52	17	26.4	3	3	3.1
Chemical engineering	50	12	41.4	4	5	4.2
Civil engineering	53	14	14.6	2	4	3.8

1. Years since bachelor of science degree.

number of respondents who participate in profit-sharing plans, benefits increased during the year. Especially significant were the increases in medical insurance (98.7%), life insurance (94.7%), and dental insurance (84.4%).

Table 3, comparing income and type of employment organization, shows that consultants have the highest median income—about $65,000. Because of a low response, median salaries for those in academia and government organizations are not statistically significant.

Comparison of income and principal work function (Table 4) shows that the highest median salary ($65,000) belongs to those in administration. The group making the largest increase was from R&D, with a 13% increase in median income to $53,000. Again, the small response from academia means those salaries should not be considered statistically significant.

Those at the corporate management supervisory level (Table 5) had the highest median income ($79,000), although a large (21%) decrease reinforces the probability that a rash of retirements have taken place during the year. Table 6, as with past surveys, possibly presents misleading data comparing income and educational field. Small numbers of respondents in many of the categories makes results difficult to interpret statistically.

Figure 1 shows that median income basically increases with years of professional experience. Figure 2 indicates that staying with one employer pays off, although after 25 years this becomes uncertain. This decrease could be due to long-term salary compression.

Taking into account the low number of responses from those who manage no employees, the more employees managed, the higher the median income (Figure 4). As expected, for those who do manage, income increases with the number of years of management experience.

The editors of *P&P* hope this survey will be useful to our readers. Comments on how it can be improved or on the magazine in general are always appreciated and should be addressed to: Projects Editor, *Pulp & Paper*, 2000 Powers Ferry Center, Suite 450, Marietta, Ga. 30067. ■

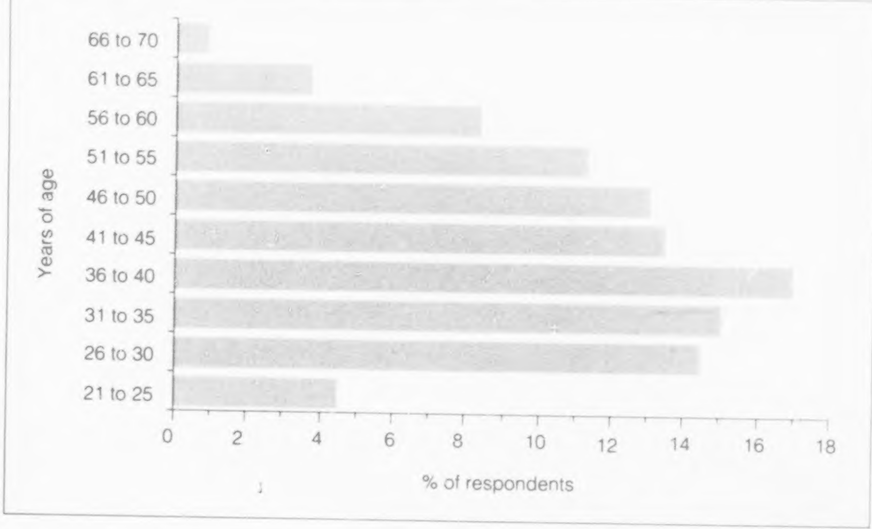


FIGURE 7: **Age distribution of respondents.**

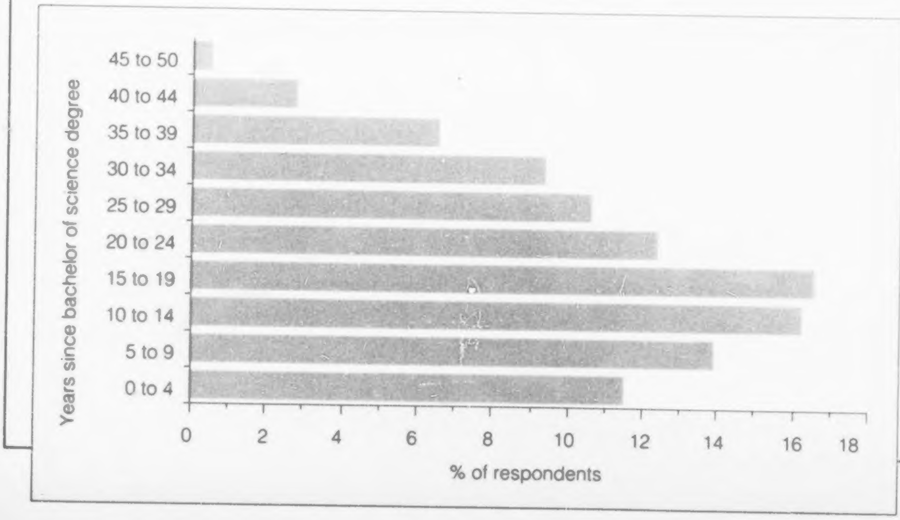


FIGURE 8: **Years of experience distribution of respondents.**

BARGAINING TRENDS POINT TO STABLE ENVIRONMENT FOR MILLS IN THE 1990s

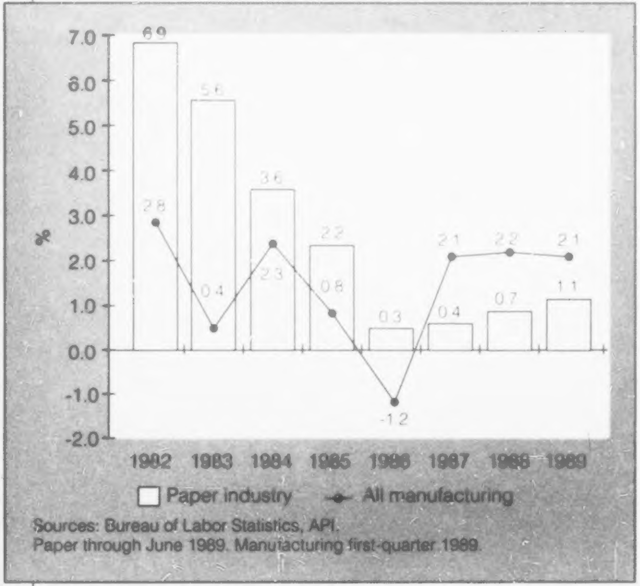
Moderate wage hikes, fewer strikes, longer contracts, and increased employee involvement will lend stability to the industry

By JULIAN M. KIEN

The collective bargaining environment in the U.S. seemed to have hit its highwater mark during the first six months of 1989. After having risen to double-digit figures during the first few years of this decade, wage increases have dramatically fallen, both in the paper industry and in U.S. manufacturing in general. They have fallen to such a degree that in 1986, the Bureau of Labor Statistics reported an average wage *decrease* of −1.2% for the first time in 30 years. Since that time, wage increases in manufacturing have risen modestly and stabilized at about 2.1% for the past three years.

Similarly, wage settlements in the paper industry have also been moderate. From a high of over 10% in 1980, paper industry settlements fell to an average first-year increase of 0.3% in 1986 and have increased gradually to their current 1.1% (Figure 1). Much of this moderation in wage increases is offset to a significant degree by the use of cash payments, some of which are as high as $9,000.

FIGURE 1: **First-year wage increases (%), 1982 to 1988.**



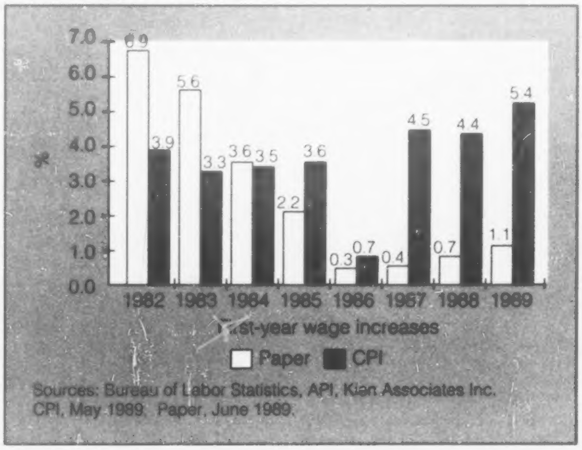
Sources: Bureau of Labor Statistics, API.
Paper through June 1989. Manufacturing first-quarter 1989.

These dramatic changes in settlement patterns in the paper industry have produced a decline in unit labor costs (ULC) in excess of 10% over the past four years, while the manufacturing sector's ULC has experienced a slight upward trend.

Average hourly earnings in the paper industry (the measure of how much a paper worker actually makes) continue to place the paper worker as the sixth highest-paid worker in the U.S., well ahead of steel and chemicals. This has been due to paper worker earnings rising by over 200% in the past 12 years (1977-89)—the highest growth rate in any of the major continuous process industries that I follow.

TWO-TIER SETTLEMENTS. While wages seem to be moving upward, it appears that a two-tier pattern of settlements is developing in the industry. Essentially, the

FIGURE 2: **Paper industry vs CPI.**



Sources: Bureau of Labor Statistics, API, Kian Associates Inc.
CPI, May 1989. Paper, June 1989.

Mr. Kien is contributing editor-human resource management for Pulp & Paper and president, Kien Associates Inc., New York, N.Y.

larger, integrated companies are settling with no increase in the first year and a 2.0% to 2.5% increase in wages in later years. The smaller, nonintegrated mills are settling at a 2.5% to 3.5% wage range. With the unions using their leverage with the smaller companies, a two-tier pattern is also emerging in how effective companies have been in reducing premium pay costs for work on weekends and holidays.

By eliminating these excessive premiums, companies are able to greatly lower their ULC and offset to some degree the increases in wages and health care costs. Eventually the disparity between the nonintegrated and integrated mills will create significant competitive pressures for those mills to follow the pattern of premium elimination and cost-competitiveness that the majors have been engaged in for the past four years.

While inflation, as measured by the Consumer Price Index, has risen somewhat this year, it is still in the relatively moderate 4% to 5% range (Figure 2). As we look at average increases for companies that settled in the first six months of 1989, however, we see that the average scheduled increase for 1990 and 1991, which has already been negotiated, will be about 2.5%. Obviously, this puts pressure for settlements at this level in those years.

TABLE 1: **Summary of paper industry collective bargaining.**

Bargaining calender 1989

	Scheduled	Completed
New England	8	5
East	21	8
Midwest	31	10
South	45	18
Pacific Coast	5	0
Total	110	41

Weighted average increases over term (%)

	1989	1990	1991
New England	0.3	2.7	2.3
East	2.8	1.9	3.1
Midwest	0.8	2.4	2.4
South	1.0	2.6	2.7
Pacific Coast	0	2.0	0
National average	1.1	2.5	2.6

Early settlements

	1987	1988	1989
New England	—	2	1
East	—	—	2
Midwest	—	—	—
South	4	6	11
Pacific Coast	—	—	2
Total	4	8	16

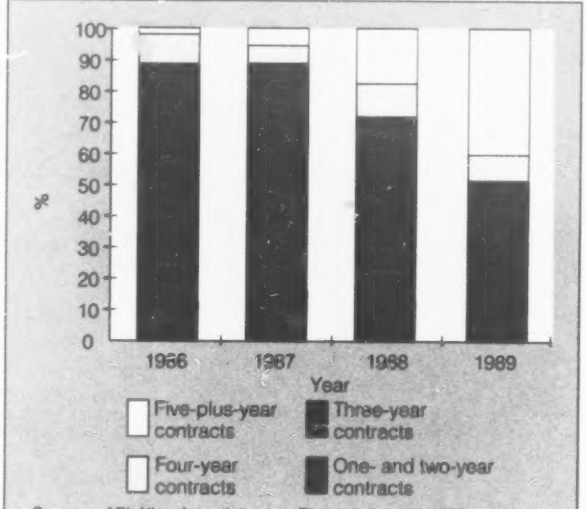
Strikes

	1987	1988	1989
New England	2	2	—
East	2	2	1
Midwest	2	—	—
South	1	—	—
Pacific Coast	2	3	—
Total	9	7	1

Source: American Paper Institute.

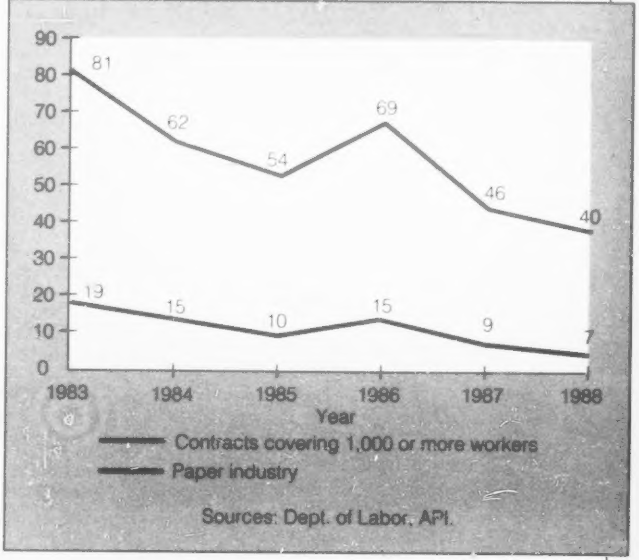
LONG-TERM AGREEMENTS. A greater number of contracts have been opened early and extended (Figure 3). In 1987, four mills reported early settlements. By 1989, 15 were reported. The significant trend toward long-term contracts will also contribute to what I think will be long-term wage stability in the paper industry. In 1986, almost 10% of the contracts settled were for longer

FIGURE 3: **Paper industry contract duration.**



Sources: API, Kien Associates Inc. Through July 11, 1989.

FIGURE 4: **Strike information, paper industry vs total U.S.**



Sources: Dept. of Labor, API.

than three years. By 1989, over 90% of the contracts were for three or more years, with over half of those for four or more years' duration.

STRIKES. The number of strikes has decreased dramatically, both in the paper industry and in the U.S. in general. As of mid-1989, only one strike has occurred, in contrast to 19 strikes five years ago (Figure 4). While 1989 is not yet over, it is apparent that the United Paperworkers International Union (UPIU) is reluctant to call strikes in the face of its experience with companies that have operated struck mills and successfully replaced workers who have struck.

In March 1989, when UPIU struck Little Rapids Paper Co., Potsdam, N.Y., the company completely and permanently replaced its striking workers within four weeks. While a strike is obviously still a weapon available to unions, its costliness and the ability of employers to respond quickly and dramatically must raise questions in the minds of union leaders about what other options they might take.

NEW UNION RESPONSES. Recently, UPIU has been using what it describes as a "pooled approach" to company bargaining. Specifically aimed at the large, integrated, multi-facility companies, pooling is designed to apply economic pressure on contract ratification by putting all facilities up for negotiation simultaneously. It is a legal way for the union to try to establish a form of multiple bargaining, without employer consent.

UPIU has indicated that this approach will be used in its bargaining with Champion International Corp. It has also attempted to use it with Stone Container Corp., International Paper Co., and others. Considering that the economic needs of each facility are varied, that often more than one union is involved at each mill, and that the National Labor Relations Board may reject the approach, I have to question whether or not this tactic will be an effective alternate weapon for the union.

EMPLOYEE INVOLVEMENT. Another major development of the past few years is a positive one. Companies are expanding employee involvement plans, including flexibility programs to enhance workers' abilities to perform many tasks after training and the development of workers' responsibility for managing their own work teams. These employee involvement efforts will be the most significant trend contributing to higher levels of performance for both the individual and the corporation in the future. ■

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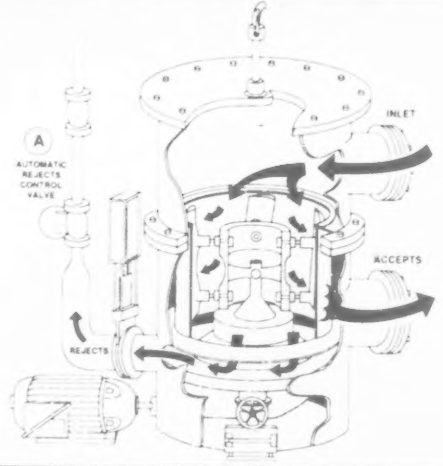

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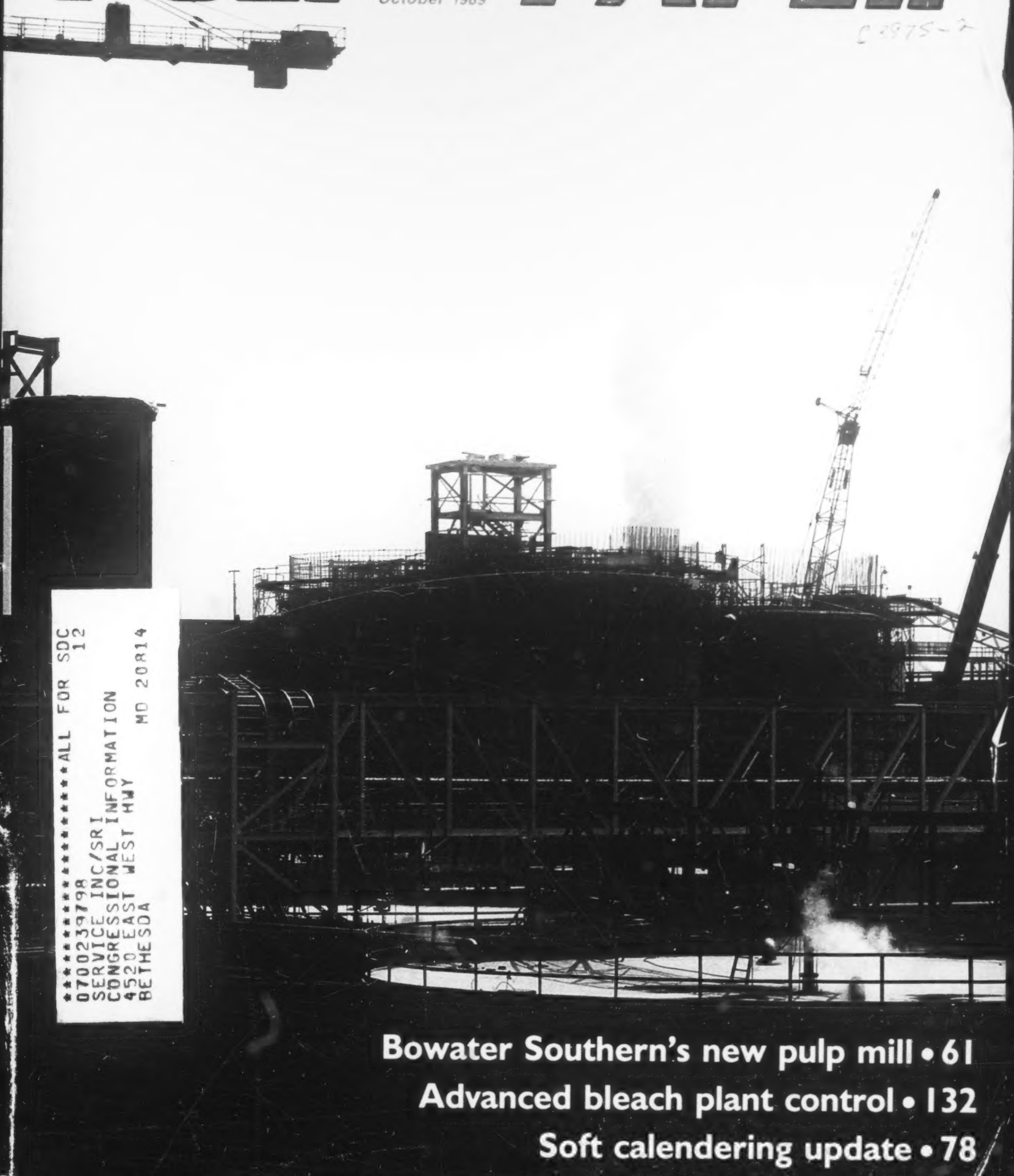

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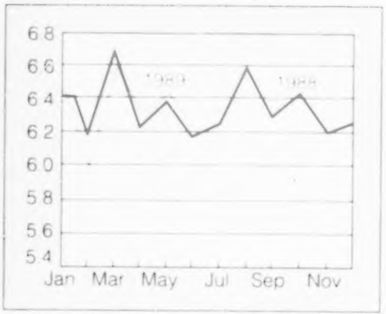
ABP

BPA

MONTH IN STATISTICS

U.S. paper and board production



U.S. production of paper and paperboard totaled 6.3 million tons in July, up 1.1% from the same month last year, according to the American Paper Institute. Production continued to hold steady at near-record levels, with output through the first seven months at a seasonally adjusted annual rate of 76.6 million tpy, down 0.1% from a year ago. The outlook was brightened by a stronger-than-expected upward revision in GNP growth and by the fact that inventories among industrial consumers of paper and paperboard are at minimum levels. This should preclude an inventory-cycle downturn anytime soon, according to API.

Among major grades, printing and writing paper was off 2.1% overall from July 1988. Uncoated groundwood paper was up almost 10%, but the larger uncoated free-sheet and coated grades were down 1.7% and 5.8%, respectively. Containerboard for domestic use was up 1.0%, and boxboard posted a 1.7% gain.

Canadian newsprint shipments totaled 775,000 metric tons in July, down 2.4% from a year earlier. Woodpulp exports plummeted 20.4%, to 534,000 tons. Newsprint and pulp mills both operated at 94% of capacity, with pulp mills down 6 percentage points from July 1988 and newsprint mills off 2 points. ■

		Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION [1]					
Newsprint	July	522	8.5	5,979	3.5
Uncoated groundwood (s)	July	148	10.4	1,744	9.9
Coated paper (s)	July	568	-4.4	6,946	-5.8
Uncoated free-sheet (s)	July	852	-6.0	11,052	-1.7
Other printing/writing	July	124	6.0	1,527	2.6
Total packaging and other paper (s)	July	390	-4.4	4,842	3.9
Tissue	July	458	1.3	5,578	2.4
Total paper	**July**	**3,062**	**-0.9**	**37,668**	**-1.3**
Unbleached kraft paperboard	July	1,685	4.1	19,592	[illegible]
Semichemical medium	July	479	0.2	5,701	1.6
Bleached paperboard	July	431	10.8	4,574	1.3
Recycled paperboard	July	683	-1.6	8,674	2.4
Total paperboard	**July**	**3,279**	**3.1**	**38,541**	**0.8**
Total U.S. paper and paperboard output	**July**	**6,341**	**1.1**	**76,209**	**-0.2**
PULP, WASTEPAPER & FIBER [2]					
Total U.S. woodpulp production	June	5,104	3.1	61,956	2.1
Market pulp production	June	738	7.6	8,824	4.3
Wastepaper consumption at paper/board mills	June	1,591	1.7	18,928	0.3
Pulpwood consumption (cords)	June	8,348	8.6	97,728	2.4
CONVERTED PRODUCTS STATISTICS [3]					
Corrugated box shipments (billion ft²)	July	24,550	0.0	181,777[6]	1.7
Containerboard inventories at U.S. box plants and mills	July 1	2,479	-5.3		
INTERNATIONAL TRADE [2]					
U.S. paper imports (including products)	June	1,040	-1.0	12,841	-0.1
Imports of Canadian newsprint	June	637	-7.7	7,985[6]	-6.9
U.S. paper exports (including products)	June	503	6.1	6,303	12.6
Exports of unbleached kraft linerboard	June	146	-16.6	2,264	4.6
Exports of woodpulp	June	562	13.1	6,354	17.3
Norscan pulp inventories[4]	July 31	930	15.0		
Norscan pulp operating rates[4]	July	96%	97%	95%	98%
CANADIAN STATISTICS [5] *(reported in metric tons)*					
Total newsprint shipments	July	775	-2.4	5,539[6]	-2.3
Operating rates	July	94%	96%	96%	99%
Inventories held by U.S. consumers	July 31	1,316	-15.6		
Other paper/board shipments	July	534	0.6	3,852	-1.3
Woodpulp shipments (export only)	July	562	-20.4	4,535	-4.0
Operating rates	July	94%	100%	93%	96%

1. American Paper Institute 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council 4. North American/Scandinavian paper-grade market pulp 5. Canadian Pulp & Paper Assn. 6. Not annualized (s) = Shipments

Paper-grade chemical market pulp: Pulp market appears to have peaked and is beginning to ease

Grade structure: Chemical paper-grade market pulp is sold in the open market and does not include captive pulp used onsite or shipped to affiliated mills within North America. Pulp is divided into grades based on whether it is made from softwood or hardwood fiber, whether it is produced by the sulfate (kraft) or sulfite pulping process, and whether it is bleached, semibleached, or unbleached.

Northern bleached softwood kraft (NBSK) is the premium pulp grade because of its long fiber length and strength. U.S. chemical paper pulp statistics include about 1.8 million tons of fluff pulp production (including exports) used in diapers and other absorbent hygiene products. Dissolving and mechanical pulp grades are excluded from the statistics.

Production/capacity: The pulp market appears to have peaked last spring and is now beginning to soften even though operating conditions remain strong. North American producers announced unchanged dollar prices for the third and fourth quarters, and some spot discounting has begun to appear on southern U.S. pulp grades (mainly mixed hardwood).

Latest industry statistics show that North American and Nordic producer inventories of chemical paper-grade market pulp jumped 82,000 metric tons in August to end the month at 1.027 million tons—the first time that inventories have been above 1 million tons in almost two years. This followed a 145,000-ton jump in inventories in July.

At the same time, indications are that paper mills in the U.S., Europe, and Asia have begun to reduce their purchased pulp inventories since pulp has become readily available and no threat of further price increases exists.

Future outlook: The pulp market is expected to remain relatively stable through the end of 1989 because of continuing strength in the U.S. and other world economies combined with only limited market pulp capacity expansion. Canadian capacity for chemical paper-grade pulp is expected to grow only 2.2% in 1989, while U.S. capacity is to increase 0.8%, according the latest industry surveys. As a result, Canadian and U.S. market pulp mills are expected to run in the 97% to 98% range in 1989.

North American capacity growth, however, will begin to accelerate in 1990 and 1991 as a number of major new projects begin to start. Several major new pulp mills are also scheduled to start up in Latin American over the next several years.

In addition, substantial new chemithermomechanical pulp (CTMP) capacity has been coming online in Canada. Mechanical market pulp capacity in Canada is expected to jump from 745,000 tons in 1988 to 1.298 million tons in 1991. New CTMP producers probably will have to price competitively to attract interest in their new pulp from nonintegrated paper mills.

Kraft pulp will also be facing increased substitution from fillers with the spread of alkaline papermaking and, to a lesser extent, from secondary fiber with the increased government pressure on the industry to recycle.

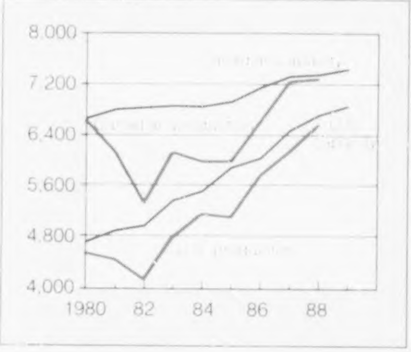
Even if no recession occurs, operating rates for North American mills are expected to decline from 97% to 98% in 1989 to 94% to 95% next year and 92% to 93% in 1991.

Pricing: The price of benchmark northern bleached softwood kraft pulp peaked at $840/ton in Europe ($830 in the U.S.) in the second quarter of 1989. This represented a $30/ton increase from the first quarter. Hardwood producers raised prices $20/ton but were able to only partially implement their increase in the U.S. By the third quarter, there were reports of spot discounting on southern mixed hardwood pulp. This was partially due to increased volume of roll pulp being offered by mills that normally produce printing/writing paper.

The market is expected to remain relatively stable through the end of this year, with some continuing spot discounting. Further pressure on prices could develop next year as new capacity begins to come on and with a further slowing in world economic growth. Since the end of 1985, the price of NBSK has more than doubled.

Year-end U.S. market pulp prices ($/metric ton delivered for NBSK: 1985, $390; 1986, $480/$520; 1987, $610; 1988, $760.

SUPPLY/DEMAND (000 tons)



FORECAST (000 short tons)

U.S.	1987	1988	1989e
Production	6,175	6,530	6,730
Capacity[1]	6,444	6,769	6,826
Utilization rate	95.8	96.5	98.6
Imports	2,700	2,836	2,910
Exports	3,670	3,876	4,100
Apparent U.S. consumption	5,205	5,490	5,540
Canada			
Production	7,200	7,225	7,220
Capacity[1]	7,335	7,390	7,429
Utilization rate	98.2	97.8	97.2

e = Estimate

1. Based on 1988 American Paper Institute and 1989 Canadian Pulp & Paper Assn. capacity surveys

TOP NORTH AMERICAN PRODUCERS

(000 short tons)

	Annual capacity			
Company	U.S.	Canada	Total	Market share (%)
1. Weyco[1,2,3,5,6]	550	660	1,210	8.5
2. G-P[1,2,5,6]	1,115[a]	—	1,115	7.8
3. CP[1,2,3,4]	—	840	840	5.9
4. IP[1,2,6]	820	—	820	5.8
5. P&W[1,2]	425	230	655	4.6
6. Fletcher[1,3,4]	—	620[b]	620	4.3
7. Repap[1,4]	—	550	550	3.9
8. Canfor[1,3,4]	—	520[c]	520	3.6
9. GNN[1,2,3]	517	—	517	3.6
10. MB[1,3,4]	—	500	500	3.5

Market share of top five companies: **32.5%**
Market share of top ten companies: **51.5%**
Total North American capacity (1989)
14.255 million metric tons

1. Bleached softwood kraft **2.** Bleached hardwood kraft **3.** Semibleached softwood kraft **4.** Unbleached kraft **5.** Bleached sulfite **6.** Fluff pulp
a. Includes Brunswick Pulp & Paper **b.** Includes Crown Forest and BCFP (but excludes minority interests) **c.** Includes 50% interest in 230,000-tpy Howe Sound joint venture

MARKET PULP

Canadian CTMP mills developing new markets

A large volume of Canadian chemithermomechanical pulp (CTMP) has begun to appear just as the North American pulp market is beginning to show some signs of weakness. Although new mills that started up in the last expansion round in 1987-88 are still moving up their production curves and developing new market niches, additional new mills are being announced for 1990-93.

About 1.7 million tpy of new Canadian capacity is either under construction or proposed for this period on top of an existing capacity base of about 930,000 tpy. Three new mills, Cascades Inc. (Port Cartier, Que.), Fibreco Export Inc., and Millar Western Pulp Ltd., started up last year, while an existing Quesnel River Pulp Co. mill was expanded, adding a total of 750,000 tpy of capacity. These new mills are now reported to be running at about 50% to 80% of capacity, with a significant amount of the output going to the Far East and Europe as well as the U.S. Reliable production/shipment figures are not yet available because several new mills do not belong to the Canadian Pulp & Paper Assn.

The first bleached chemi-thermomechanical pulp (BCTMP) mills created higher-freeness softwood pulps, most of which were used for tissue/towel applications. The newer mills are focusing on lower-freeness pulp, particularly aspen, for use in printing/writing paper. A large number of trials have been under way at nonintegrated and partially integrated U.S. paper mills. The results have been positive and negative. "There are definite papers where BCTMP is presently not acceptable and others where it is superior or offers cost advantages over some other possibilities," said Dan Breck, new vice president-marketing, Fibreco Pulp Inc.

Classifications pose barrier. Nevertheless, he noted that a major barrier to the use of BCTMP in wood-free printing and writing paper is "outdated grade classifications limiting mechanical pulp content to 10%." Such rules equate BCTMP with earlier stone groundwood pulp and are no longer valid, Breck explained. "Many papermakers and end users are aware of this but are restricted from using new types of fiber for fear of jeopardizing market position or incurring stiff legal penalties."

Printing/writing grades in which BCTMP is believed to have significant potential include forms paper, uncoated bond, and some book paper. Probably the biggest quality problem now facing BCTMP-containing paper is some brightness reversion over time. However, about a third of the paper specifiers in a recent survey indicated they would be willing to switch to a BCTMP-containing grade if no brightness loss occurred over a six-month period. Nearly two-thirds would be satisfied if no loss occurred over a one-year period, according to a study by NLK-Celpap Inc.

Pricing strategy. While part of the appeal of BCTMP has probably been such attributes as bulk and opacity, another part has certainly been cost and concern among nonintegrated papermakers with obtaining adequate pulp supplies. Now, with southern hardwood pulp prices weakening, some papermakers might feel tempted to switch back. Canadian BCTMP producers reportedly have been pricing their pulp about $80 to $120/ton below hardwood kraft pulps.

"If CTMP producers do not keep their price differential, a lot of hard work developing new products and markets is just going to be tossed overboard," one BCTMP buyer warns. While some of the new Canadian BCTMP mills have competitive manufacturing costs, some might end up being squeezed if a sharp decline in kraft pulp prices occurs. In general, however, the new Canadian mills are in a better cost position than BCTMP mills in Scandinavia, and other parts of the world due to availability of the best species of wood (spruce and aspen) and low hydropower costs. One consultant expressed doubt that another market BCTMP mill would be built in Scandinavia and progress on a couple of projects proposed for the U.S. is being viewed skeptically.

An environmental advantage? Another promising new BCTMP market is in fluff pulp for baby diapers and sanitary products. Interest in BCTMP, especially in Europe, was spurred by

Canadian market CTMP mills, existing and proposed.

Company	Location	Capacity (000 metric tpy)	Startup date
Quesnel River Pulp Co.	Quesnel River, B.C.	90S[1]	1982
Temcell	Temiscaming, Que.	95 A/S	1986
Stone Container Corp./ Consolidated-Bathurst Inc.	Bathurst, N.B.	90 S[2]	1988
Cascades Inc.	Port Cartier, Que.	210 S	1988
Fibreco Export Inc.	Taylor, B.C.	180 S	1988
Quesnel River Pulp Co.	Quesnel River, B.C.	60 S[2]	1988
Millar Western Pulp Ltd.	Whitecourt, Alta.	210 A/S	1988
Donohue-Matane Inc.	Matane, Que.	190 S	1990
Temcell	Temiscaming, Que.	150 A/S	1991
Alberta Energy Co.	Slave Lake, Alta.	120 A	1991
Millar Western Pulp Ltd.	Meadow Lake, Sask.	240 A/S	1992
Louisiana-Pacific Corp.	Chetwynd, B.C.	155 S	1992
Shinho Paper Manufacturing Co. Ltd.	Thunder Bay, Ont.	150 A[3]	1992
Cascades Inc.	Cabano, Que.	115 A	1992
Fibreco Export Inc.	Taylor, B.C.	180 A	1993
Alcan Foil Products	Vanderhoof, B.C.	220 A/S	n.a.
Taiwanese paper company	Alberta	240 A/S	n.a.

A = aspen (hardwood); S = softwood (mainly spruce and some lodgepole pine).

1. Reflects about half of total capacity available for market sale; remainder mainly TMP shipped to Japanese partner.
2. Reflects about half of total capacity available for market sale (mainly unbleached).
3. Abitibi-Price to take about one-third of output.

Note: Scott Paper Ltd.'s planned BCTMP mill at Crabtree, Que., is mostly captive.

concern over dioxin in bleached kraft fluff pulp. Some diaper manufacturers in Europe, such as SCA's Peaudoce, have introduced CTMP-containing diapers advertised as friendly to the environment. However, Procter & Gamble has countered this by using "chlorine-free" bleached kraft fluff in its diapers in Europe and reportedly has increased its market share in Sweden.

For a current roundup of issues involving CTMP, order the proceedings of *Pulp & Paper*'s "CTMP Markets: Present & Future" conference, held Sept. 19-20, 1989. For more information, contact the *Pulp & Paper* Seminars Dept. Telephone: (415) 995-2471; fax: (415) 543-0256. ■

Champion moves closer to greenfield mill in Brazil

Champion International Corp.'s Brazilian subsidiary, Champion Papel e Celulose SA, expects to get government approval in November to begin construction of a greenfield pulp and paper mill near Três Lagoas, in Mato Grosso do Sul state. A company spokesman said that Champion has decided to go with the greenfield mill rather than expand its existing pulp and free-sheet mill in Mogi-Guaçu, which is about 350 miles from the greenfield site. The 600-metric-tpd pulp mill will be supplied by eucalyptus plantations. Already, Champion has acquired about 120,000 acres on which to plant the fast-growing trees. The pulp mill is expected to start up in early 1993.

Champion will be able to take advantage of Brazilian laws that allow up to a 70% discount of excise taxes on the sale of finished product during the first five years of production, according to the *Journal of Commerce*. It also will apply for benefits under a Brazilian export incentives program that will enable it to import equipment and components. Reportedly, Champion will spend $850 million over the next ten years in Brazil, and investments in the new mill could reach $1 billion. ■

First U.S. BCTMP mill plans go forward with investors

A group of investors that has been planning to build a bleached chemithermomechanical pulp (BCTMP) mill in San Augustine, Texas, for the past three years indicated last month that it is near to signing major joint-venture partners and expects to make an announcement shortly. Negotiations are nearing an end with General Electric Credit Corp., and some overseas investors are also interested.

The greenfield mill project was launched in 1986 by Evco Industries Inc., a wood products producer and exporter. Later, Bill Price, a seasoned marketing executive in the paper industry who now works for Newsprint South Inc., joined the venture. Price was followed by Ted Strauss, director at Bear Stearns, who brought his financial expertise to the group.

Besides General Electric, investor groups from Japan, Rep. Korea, and Austria are considering participating in the project, noted William R. Evans, president and CEO, Evco. Trials on BCTMP made from the "overabundance" of southern yellow pine available within a 100-mile radius of San Augustine were very positive, he said. Bleaching studies indicated that a brightness as high as 83° can be obtained economically.

Although more bleaching agents are required to brighten the pulp than needed when using spruce or aspen, the pulpwood around San Augustine appears to be stronger and better for BCTMP in other ways than aspen, noted Evans. Sprout-Bauer is studying a chip washing process that would eliminate any aftertaste from BCTMP so that it could be used in food or liquid packaging.

Output from the 500-metric-tpd mill would be geared to the diaper/sanitary napkin and food board (milk cartons, frozen food containers, etc.) end uses, he said. Letters of intent have been signed to purchase about 30% of the mill's production. Robert Davidson, former president of Price & Pierce International Inc., was recently named to handle marketing.

The company has also named Ford Bacon & Davis to do the preliminary engineering work, Brown & Root U.S.A. for the not-to-exceed price of the project, and Arthur Andersen & Co. for cash flow projections. A review of the project done by Nystrom Lee Kobayashi (NLK) Inc. for General Electric was positive, noted Evans. The partners expect mill construction could begin late this year and are aiming for a 1991 startup. The project is not to exceed $308 million and will be 100% financed. ■

Malette slates C$150-million expansion at Smooth Rock

Malette Kraft Pulp & Power, a division of Waferboard Corp., announced that it will gradually expand the capacity of its bleached kraft softwood market pulp mill in Smooth Rock Falls, Ont., from about 305 metric tpd to over 500 tpd by mid-1992.

The C$150-million expansion and modernization will also enable the mill to make hardwood pulp. The project is subject to completion of final negotiations with the government and financial institutions. A mill spokesman said that both the provincial and federal governments reportedly will provide a small amount of assistance.

Malette said that the project will improve pulp quality, reduce chemical costs, and exceed environmental standards. It will also provide at least 250 new jobs in woodlands and transportation. The project will take place in three stages.

The pulp machine will be installed by late 1990. (The mill has purchased a used pulp machine from the U.S.) The second phase, to be completed sometime around the beginning of 1992, involves installation of a larger recovery boiler, which is going to be partially or completely new, and evaporators.

The third stage, to be completed in 1992, will involve expansion of the existing Kamyr continuous digester, probable installation of an oxygen delignification system, and upgrades to the bleach plant, chlorine dioxide generators, and recausticizing area. This will enable the mill to meet the biological oxygen demand level of 1.4 kg/tpd of pulp that Ontario has established for 1992.

When the project is completed, the mill will make 75% softwood pulp and 25% hardwood pulp from poplar. Malette currently sells its output in a 600-mile radius of the mill: about 75% in Canada and 25% in the U.S. After the expansion, it hopes to export pulp to Europe for the first time, a mill spokesman said.

The mill's existing cogeneration plant will provide energy for the expansion. It currently produces about 10 to 12 MW/day of electricity by burning hog fuel. When the expansion is complete, the mill will consume about 15 MW/day, while the excess 5 to 12 MW will be sold to Ontario Hydro. ■

RECYCLED PAPER

Smurfit to use magazine stock in newsprint

This fall, Smurfit Newsprint Corp. will begin using some postconsumer coated magazine paper at its 211,000-metric-tpy Oregon City, Ore., recycled newsprint mill. Smurfit's reclamation division has already begun collecting magazines from Oregon residents, who are separating them from their old newspaper (ONP). The new flotation system, slated to go online last month, will eventually enable the mill to replace about 30% of its ONP with magazine stock. Currently, the mill's furnish is about evenly divided between woodpulp and ONP. This would make Smurfit the second newsprint mill in the U.S. to use magazine paper to make newsprint. Stone Container Corp.'s Snowflake, Ariz., newsprint mill also uses magazine stock in its furnish. Smurfit has coined its deinking system "reNews."

A mill spokesman said that Smurfit has been studying recycling magazine stock for two to three years, and trial runs have shown that a sheet made with this fiber has higher brightness and better printability and is stronger than a sheet made with ONP. Clay residue from the repulped magazines helps remove pressure-sensitive adhesive contaminants. The Counterflo washing systems allow flexographic-printed newspaper to be deinked. Flotation cells are supplied by Beloit. Other equipment suppliers were not named.

The company plans by early 1990 to complete installation of the equipment at its Newberg, Ore., mill, which has capacity for about 350,000 tpy of newsprint. This will probably require the company to draw magazine stock from Washington state as well. The Oregon City mill is the older of the two mills and has three machines. A few years ago, Smurfit said it was considering converting one or more of the machines to produce higher-value groundwood printing paper, and it is still reviewing that option. However, the company now is concentrating much of its major capital investment attention on a proposed 255,000-tpy recycled newsprint mill to be built somewhere in the Northeast.

Deinking upgrades at the two Oregon mills are part of a $50-million, three-year quality-improvement plan begun by Smurfit shortly after it bought out Publishers Paper Co. in 1986. Other improvements in this program included work on the paper machines, a thermomechanical pulp plant, and process controls. At the same time, productivity-related improvements were completed in another capital program. Further details were not released, however. ■

North Pacific considers adding deinking capacity

North Pacific Paper Co. is tentatively planning to add a deinking plant to its Longview, Wash., 470,000-metric-tpy newsprint mill. The plant would be built to coincide with the addition of a 230,000-tpy newsprint and groundwood paper machine at that mill by sometime in 1991.

North Pacific, which is held by Weyerhaeuser Co. (90%) and Jujo Paper Co. Ltd. (10%), is currently waiting for environmental permits, a source said. If all goes as expected, construction would begin this fall. The approximately $350- to $400-million project was originally announced at the beginning of 1989, when it was thought that the pulp needed for the third paper machine would require adding thermomechanical pulping capacity. However, as recycling efforts and legislation mandating use of recycled newsprint have swept the country, recycled fiber has become a better choice, it was noted.

The deinking plant is expected to produce 162,000 to 180,000 metric tpy of deinked pulp made from about 200,000 to 215,000 tpy of old newspapers. At the same time, the mill's existing nine thermomechanical pulp refining lines, which currently supply about 90% of the fiber furnish for the two newsprint machines, would be upgraded to raise efficiency and increase output, a source said. Kraft market pulp would make up any deficiencies in raw material needs for the time being.

The paper machine reportedly is being purchased from Beloit Corp., supplier of the mill's other two twin-wire paper machines, according to reliable sources. The company has refused to comment on the status of th project lately, indicating that it is still "being studied." However, the addition of deinking capacity into the plans changes the outlook for the new machine quite a bit, giving it a competitive edge among 11 newsprint machines coming online in North America sometime between 1989 and 1991.

The North Pacific mill would be the first recycled newsprint facility in Washington and only the second in the entire West. Smurfit Newsprint Co. already has two recycled newsprint mills in Oregon with total capacity of about 561,000 tpy. ■

U.S. recycled newsprint legislation, by state.

State[1]	Consumption tax on virgin newsprint[2]	Mandatory goal	Usage timetable	Status
California	None	25%	1991	Pending
		50	2000	
Connecticut	None	20	1993	Passed
		90	1998	
Florida	10¢/ton until 10/92. 50¢/ton if goal not reached	50	1992	Passed
Illinois	10¢/ton	10	1992	Pending
		50	1998	
New Jersey	None	45	1989	Pending
		90	1991	
New York	None	10	1991	Pending
Wisconsin	10% of list price per ton	10	1991	Pending
		50	1994	

1. Does not include preference purchasing provisions for state agencies. Includes states where legislation is most advanced. Louisiana, Minnesota, Nebraska, Oregon, Pennsylvania, Rhode Island, and Virginia are other states considering similar bills.
2. Applies to amount of total consumption that must be recycled-fiber based. Ranges imply goals to be phased in between these dates.

Source: American Newspaper Publishers Assn.